

## **CHAPTER TWO**

### **PROFILE OF THE CONSTRUCTION AND DEVELOPMENT INDUSTRIES**

#### **2.1 INTRODUCTION**

The construction and development (C&D) industry plays an integral role in the nation's economy, contributing approximately five percent of the Gross Domestic Product. Establishments in this industry are involved in a wide variety of activities, from land development and subdivision to homebuilding, construction of nonresidential buildings and other structures, heavy construction work (including roadways and bridges), and a myriad of special trades such as plumbing, roofing, electrical, excavation, and demolition work. C&D activity affecting water quality typically involves site selection and planning, and land-disturbing tasks during construction such as clearing, excavating and grading. Disturbed soil, if not managed properly, can be easily washed off-site during storm events. Storm water discharges generated during construction activities can cause an array of physical, chemical and biological impacts. EPA's proposed effluent guidelines for the C&D industry seek to reduce the environmental and economic effects of storm water runoff from construction sites.

Several characteristics of the C&D industry affect the structure of this economic analysis:

- Individuals (e.g., homebuyers) are often the direct customers of the C&D industry. With individuals as the direct consumer it is necessary to address issues such as cost passthrough and the impacts of regulations on housing affordability.
- There are complex and varying relationships between developers and builders, resulting in a variety of different business models. Developers may undertake all site improvements and sell completed lots directly to builders, act as builders themselves and remain onsite to build out the development, or some combination of the two.
- The C&D industry is dominated by small businesses. As a result, EPA will carefully consider the impacts on small businesses in accordance with the Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).
- C&D activities are highly localized. This suggests that a regional approach to analysis is appropriate to account for varying market conditions.

- The standard industry definitions include a large number of establishments primarily engaged in remodeling activities, who are less likely to be involved in land disturbing activities.

The C&D industry as defined for this proposed rule is comprised of four main industry groups that will further affect the structure of this analysis:

- Land development and subdivision
- Residential construction
- Nonresidential construction
- Heavy construction

These four industry groups encompass those parts of the industry most likely to engage in land disturbing activities. Land disturbing activities are further described in the Development Document (EPA, 2002a) and the impacts of these activities are described in the Environmental Assessment (EPA, 2002b).

### **2.1.1 Recent Trends in the C&D Industry**

Between 1992 and 1997, the number of establishments with payroll in the C&D industries overall increased from 235,789 to 261,617, an increase of 11.0 percent (see Table 2-1). This overall modest increase masks some significant offsetting changes in establishment counts within individual industries, as defined under the North American Industrial Classification System (NAICS), i.e.:

- The number of establishments in the land development industry group (NAICS 2331) *decreased* by 46.6 percent;<sup>1</sup>

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<sup>1</sup> The decrease in the number of developers may have been a response to changes in tax laws and the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989 (Pub.L. 101-73, August 9, 1989) and the 1993 implementing regulations. The objective of FIRREA and the implementing regulations was to correct events and policies that led to a high rate of bankruptcies in the thrift industry in the late 1980s. The regulations changed lending practices by financial institutions, requiring a higher equity position for most projects, with lower loan-to-value ratios, and more documentation from developers and builders. (Kone, 2000).

- There was a 13.5 percent *increase* in the number of establishments in residential and nonresidential construction (NAICS 233, except 2331);
- The number of establishments in heavy construction *increased* by 14.5 percent;
- There was a 33.0 percent *increase* in the number of special trades contractor establishments, (NAICS 235), including a 31.2 percent increase among excavation contractors and a 59.6 percent increase among demolition contractors.

**Table 2-1**  
**Number of Establishments in Construction and Development Industries, 1997 vs 1992**

NAICS	Industry	1992	1997	Pct. Change
233, exc. 2331	Building, developing, and general contracting, except land development and subdevelopment	168,407	191,101	13.5%
2331	Land development and subdevelopment	15,338	8,185	-46.6%
234	Heavy construction	37,180	42,557	14.5%
235 <sup>a</sup>	Special trade contracting	14,864	19,771	33.0%
<b>Subtotal</b>		<b>235,789</b>	<b>261,617</b>	<b>11.0%</b>

<sup>a</sup> Includes NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors).  
 Figures may not add to totals due to rounding.  
 Source: U.S. Census Bureau (2000a).

### 2.1.2 Data Sources Used

Several data sources are used in this profile chapter to characterize the C&D industry. The primary data source is the 1997 Census of Construction (herein referred to as Census), conducted every five years by the U.S. Census Bureau. A second data source comes from the U.S. Small Business Administration (SBA). The SBA data is used because it provides firm-level data that is necessary for economic modeling purposes and for the small entity analysis (the Census data is reported at the level of the construction establishment, not the firm). Table 2-2 compares the Census data with that from SBA in order to further clarify the differences and identify how each are used in this Economic Analysis. The majority of this chapter uses data from the 1997 Census to profile the C&D industry, since that source provides a greater level of detail on industry characteristics.

**Table 2-2  
Comparison of Major Data Sources**

Characteristic	Data Source	
	Census of Construction	SBA
Level of Detail	Establishment <sup>a</sup>	Firm <sup>b</sup> (company) and establishment
Source of Data	Survey (sent to approx. 130,000 establishments from a universe of 650,000)	County Business Patterns SUSB report, which ultimately relies on administrative records data
How the Data are Applied in this Analysis	Industry-level analysis to determine the number of potentially affected establishments	Firm-level analysis, for purposes of determining the number of potentially affected firms considered “small” by SBA size standards

<sup>a</sup> The Census Bureau defines an establishment as “a relatively permanent office or other place of business where the usual business activities related to construction are conducted” (U.S. Census Bureau, 2000a).

<sup>b</sup> A firm is considered to be an aggregation of the establishments owned by a single company; therefore, one firm may be comprised of several establishments.

### 2.1.3 Organization of this Chapter

The purpose of this industry profile is to provide an overview of the C&D industries, describe their key characteristics and structure, and analyze current and historical trends. Section 2.2 describes the process that EPA used to identify and define the industry for the purposes of the proposed rule. Section 2.3 presents characteristics of the C&D industry, including both industry and firm-level data. Section 2.4 discusses supply and demand factors in the C&D industry while Section 2.5 describes various economic and financial characteristics of the industry. Section 2.6 looks at key business indicators and ratios. Section 2.7 covers industry growth and trends, and Section 2.8 takes a brief look at international competition in the C&D industry.

## **2.2 INDUSTRY DEFINITION**

### **2.2.1 Basis for Regulation**

The proposed rule will cover establishments within the construction sector (NAICS 23) that disturb the land at construction sites of one acre or more.<sup>2</sup> These land-disturbing activities may include site preparation and site clearing tasks such as tree removal, excavation, blasting, scraping, and grading, and are generally accomplished with the aid of heavy equipment such as skidders, bulldozers, backhoes, excavators, and graders. These activities may destabilize soils and create conditions that allow storm water to accumulate and flow across the site. This increase in storm water flow can cause erosion and lead to the transport of soil particles and attached pollutants, which eventually may be conveyed offsite and discharged into receiving waters. Both the increased flow and associated pollutant and sediment loads that result from land-disturbing activities can negatively impact the biological, physical, and chemical characteristics of the receiving waters.

The proposed effluent guidelines will build upon the Phase I and Phase II storm water regulations promulgated under the National Pollutant Discharge Elimination System (NPDES), as well as upon EPA's storm water construction general permit (CGP). The CGP is the vehicle through which Phase I regulations are being implemented, and upon revision in 2003 it will also reflect the Phase II regulations. The CGP also will be the vehicle through which the proposed rule is implemented. The proposed rule will also build upon current state and local storm water control requirements by adding increased specificity and consistency to these requirements. See Chapter Three for more information on the proposed rule. The methodology chapter provides further detail on the planned implementation of the proposed rule.

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<sup>2</sup> The Bureau of the Census classifies industries according to the North American Industrial Classification System, or NAICS. Under the NAICS, economic activity is first divided into twenty broad 2-digit industry codes. One of these is Construction (NAICS 23). Each 2-digit industry is further subdivided into 3-, 4-, and 5-digit level industries.

### **2.2.2 Industry Definition**

For the purposes of this economic analysis, the “C&D industries” are assumed to include those establishments within the construction sector (NAICS 23) that may be involved in activities that disturb the ground at construction sites. This includes site clearing or site preparation activities such as tree removal, excavation, blasting, scraping, grading, etc. EPA believes that many establishments in NAICS 233 (Building, developing, and general contracting) and NAICS 234 (Heavy construction) are likely to engage in such activities on a regular basis. Establishments within selected 5-digit industries that are part of NAICS 235 (Special trade contractors) may also engage in land-disturbing activities. The latter may include NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors). However, as discussed in Section VI.A in the preamble of the proposed rule, Special trade contractors are typically subcontractors and not identified as NPDES permittees. Table 2-3 identifies the industries that may be covered by the proposed regulations.

**Table 2-3**  
**Industry Definitions for Construction and Development Industry Profile**

NAICS Code	Industry	Relevant SIC Codes <sup>a</sup>
<b>233</b>	<b>Building, developing, and general contracting</b>	
2331	Land subdivision and development	
23311	Land subdivision and development	6552 Land subdividers and developers, except cemeteries
2332	Residential building construction	
23321	Single-family housing construction	1521 General contractors—single-family houses 1531 Operative builders (partial) 8741 Management services (partial)
23322	Multifamily housing construction	1522 General contractors—residential buildings other than single-family (partial) 1531 Operative builders (partial) 8741 Management services (partial)
2333	Nonresidential building construction	
23331	Manufacturing and industrial building construction	1531 Operative builders (partial) 1541 General contractors—industrial buildings and warehouses (partial) 8741 Management services (partial)
23332	Commercial and institutional building construction	1522 General contractors—residential buildings, other than single-family (partial) 1531 Operative builders (partial) 1541 General contractors—industrial buildings and warehouses (partial) 1542 General contractors—nonresidential buildings except industrial buildings and warehouses 8741 Management services (partial)
<b>234</b>	<b>Heavy Construction</b>	
2341	Highway, street, bridge, and tunnel construction	
23411	Highway and street construction	1611 Highway and street construction contractors, except elevated highways 8741 Management services (partial)
23412	Bridge and tunnel construction	1622 Bridge, tunnel, and elevated highway construction
2349	Other heavy construction	
23491	Water, sewer, and pipeline construction	1623 Water, sewer, pipeline, and communications and power line construction (partial) 8741 Management services (partial)
23492	Power and communication transmission line construction	1623 Water, sewer, pipeline, and communications and power line construction (partial) 8741 Management services (partial)
23493	Industrial nonbuilding structure construction	1629 Heavy construction, n.e.c. (partial) 8741 Management services (partial)
23499	All other heavy construction	1629 Heavy construction, n.e.c. (partial) 7353 Heavy construction equipment rental and leasing (partial) 8741 Management services (partial)
<b>235</b>	<b>Special trade contractors</b>	
23593	Excavation contractors	1794 Excavation work special trade contractors
23594	Wrecking and demolition contractors	1795 Wrecking and demolition work special trade contractors

<sup>a</sup> NAICS recently replaced the SIC (Standard Industrial Classification) System.

Source: U.S. Census Bureau (2000a).

As seen in Table 2-3, each NAICS industry is comprised of one or more industries defined under the former Standard Industrial Classification (SIC) system. With the 1997 Census, the Census Bureau switched from reporting data on an SIC basis to an NAICS basis, thereby making it difficult to compare data from 1997 with that from the 1992 and earlier Census reporting periods. Within this economic profile the objective is to provide data at the most detailed level as possible, while still maintaining the ability to provide meaningful comparisons between 1997 and earlier Census periods. With this in mind, most of the statistical tables contained in this profile reflect the following industry breakdown:<sup>3</sup>

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NAICS 233, except 2331	Building, developing, and general contracting, except land subdivision and land development
NAICS 2331	Land subdivision and land development
NAICS 234	Heavy construction
NAICS 235	Special trades contractors <sup>a</sup>

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<sup>a</sup> Covered industries to include NAICS 23593 (Excavation contractors) and NAICS 23594 (Wrecking and demolition contractors) only, when possible.

### 2.3 INDUSTRY CHARACTERISTICS

Several steps are used to define the number of C&D establishments that may be affected by the proposed regulations. First, EPA identifies all C&D establishments as defined above using data from the 1997 Census of Construction. Second, EPA estimates the number of establishments classified as C&D establishments that are primarily engaged in remodeling work, using data from the National Association of Home Builders (NAHB) and the Joint Center for Housing Studies at Harvard University (Joint Center). Third, EPA estimates the number of establishments classified as C&D establishments that are engaged in C&D activities but are unlikely to disturb more than one acre of land, using data from Census and various secondary sources. Section 2.3.1 looks at the industry-wide characteristics of C&D establishments, including number and size of establishments, employment, and geographic distribution of

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<sup>3</sup> Some detailed breakdowns may be available only at the 3-digit NAICS level, in which case separate data for NAICS 2331 cannot be provided and will be included with data for all of NAICS 233. NAICS 233, except 2331, includes data for both residential and nonresidential construction activities. Where more detailed data are available they are included in this profile. In some cases data at a more detailed NAICS level is available (e.g., 5-digit NAICS) but was considered too detailed to present in the body of this profile. The availability of such data is noted throughout the profile, and reference is made to Appendix 2A where such tables are presented.



establishments. Section 2.3.2 describes firm-level data for the C&D industry. Section 2.3.3 describes the number of small entities, and section 2.3.4 looks at the number of entities in the C&D industry that disturb less than one acre during the normal course of business. The estimated number of potentially affected establishments is presented in Section 2.3.5.

### **2.3.1 Establishment-Level Data**

This section presents data for all establishments within the C&D industry as defined in Section 2.2, based primarily on 1997 Census of Construction sources. Included is information on the number and size of establishments, geographic distribution, employment, payroll and benefits, and level of specialization.

#### ***2.3.1.1 Number and Size of Establishments***

Data from the Census of Construction indicate there were a total of 261,617 establishments with payrolls in the C&D industries in 1997 (i.e., NAICS 233, 234, 23593, and 23594; see Table 2-4). Of these, the largest number of establishments are in NAICS 233 (Building, developing, and general contracting). This subsector includes 199,289 establishments, representing 76.2 percent of all C&D establishments. Within NAICS 233, single-family home construction (NAICS 23321) accounted for the majority of establishments (138,849 out of 199,289 or 69.7 percent).

Land development and subdevelopment (NAICS 2331) accounted for 8,185 establishments or 3.1 percent of all establishments in the C&D industries. NAICS 234 (Heavy construction) includes 42,557 establishments or 16.3 percent of the total. Of these, 27 percent are primarily highway and street construction contractors, another 27 percent are contractors that work on water, sewer, pipeline, communications and power line projects, and 43 percent are engaged in other types of heavy construction (All other heavy construction). Within the special trades contractors subsector (NAICS 235), NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) together account for

19,771 establishments, or 7.6 percent of the C&D industries total. Excavation contractors account for over 90 percent of these establishments.

**Table 2-4**  
**Number of Establishments in the Construction and Development Industry, Based on the 1997 Census of Construction**

NAICS	Industry	Establishments With Payrolls	
		Number	Percent of Total
233	Building, developing, and general contracting	199,289	76.2%
2331	Land development and subdivision	8,185	3.1%
23321	Single-family residential building construction	138,849	53.1%
23322	Multi-family residential building construction	7,543	2.9%
2333	Nonresidential construction	44,710	17.1%
234	Heavy construction	42,557	16.3%
235 <sup>a</sup>	Special trade contracting	19,771	7.6%
<b>SUBTOTAL</b>		<b>261,617</b>	<b>100.0%</b>

<sup>a</sup>Covered industries include NAICS 23593 (excavation contractors) and NAICS 23594 (wrecking and demolition contractors) only.

Across the board, the C&D industries are dominated by small establishments.<sup>4</sup> As shown in Table 2-5, Census reports that some 60.6 percent of establishments with payrolls have fewer than 5 employees, 77.8 percent have fewer than 10 employees, and 87.1 percent have fewer than 20 employees.<sup>5</sup> Overall, only 1.1 percent of C&D establishments with payrolls have 100 or more employees. On average, establishments in NAICS 234 (Heavy construction) are somewhat larger than those in the other NAICS, with a lower percentage of establishments appearing in each of the smaller establishment size classes.

<sup>4</sup> Establishments are officially defined as “small” by the SBA according to size standards based on either number of employees or annual revenue (13 CFR 121). Qualifying revenue levels differ among NAICS industries, and within the C&D industries there is a range of qualifying revenue levels, from \$5.0 million for NAICS 23311 (Land subdivision and development) to \$27.5 million for the majority of industries within NAICS 233 and 234. A more detailed review of industry size distribution based on the SBA definitions will be presented as part of the Small Entity Impact Analysis.

<sup>5</sup> And, as noted above, some 450,338 establishments in the C&D industries have *no* employees.

The preponderance of small establishments is equally apparent when analyzed on the basis of revenue size class. Overall in 1997, 37.1 percent of establishments with payrolls had annual revenues below \$250,000; 54.7 percent had annual revenues below \$500,000; and 69.6 percent had annual revenues below \$1.0 million. These data are shown in Table 2-6. Only 9,118 establishments, representing 3.5 percent of the total, had annual revenues in excess of \$10.0 million. Section 2.3.1.7 contains more information on small entities in the C&D industry and the small business analysis is presented in Chapter Six of this EA.

In addition to the small establishments with payrolls, a large number of establishments—some 450,338 in 1997<sup>6</sup>—operate with no paid employees and are not included in the totals in Tables 2-4 through 2-6. Available data suggests these establishments are very small relative to establishments with payrolls. While employer establishments in NAICS 233 and 234 had \$517.7 billion in receipts for 1997, nonemployer establishments had only \$36.5 billion in receipts, which represents only 7 percent of the receipts of employer establishments.

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<sup>6</sup> Includes establishments in NAICS 233 and 234 only. Data on nonemployer establishments was not available at the 5-digit NAICS level for NAICS 235, thus information for NAICS 23593 and 23594 could not be separated from the rest of NAICS 2359 (Other special trade contractors). Including all nonemployer establishments in NAICS 2359 (339,521), the total number of such establishments in the C&D industries is 789,859.

**Table 2-5**  
**Number of Small Establishments with Payrolls in the Construction and Development Industry, Based on Employment**

NAICS	Industry	Total	Establishments with less than 5 employees		Establishments with less than 10 employees		Establishments with less than 20 employees	
			No.	Percent of Total	No.	Percent of Total	No.	Percent of Total
233 <sup>a</sup>	Building, developing, and general contracting	199,289	138,926	69.7%	172,079	86.3%	187,672	94.2%
234	Heavy construction	42,557	18,956	44.5%	26,802	63.0%	33,337	78.3%
235 <sup>b</sup>	Special trade contractors	19,771	700 <sup>c</sup>	3.5%	4,690	23.7%	6,833	34.6%
<b>TOTAL</b>		<b>261,617</b>	<b>158,582</b>	<b>60.6%</b>	<b>203,571</b>	<b>77.8%</b>	<b>227,842</b>	<b>87.1%</b>

<sup>a</sup> Data below the 3-digit NAICS (i.e., for NAICS 2331 Land development and subdevelopment) not publishable.

<sup>b</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

<sup>c</sup> Data for NAICS 23593 (Excavation contractors) not included in this calculation because data did not meet publication standards.

Figures may not add to totals due to rounding.

Source: U.S. Census Bureau (2000a).

**Table 2-6**  
**Number of Small Establishments in the Construction and Development Industry, Based on Value of Business Done**

NAICS	Industry	Total	Establishments with less than \$250,000 in business		Establishments with less than \$500,000 in business		Establishments with less than \$1 million in business	
			No.	Percent of Total	No.	Percent of Total	No.	Percent of Total
233 <sup>a</sup>	Building, developing, and general contracting	199,289	83,536	41.9%	118,493	59.5%	147,917	74.2%
234	Heavy construction	42,557	13,364	31.4%	20,238	47.6%	26,726	62.8%
235 <sup>b,c</sup>	Special trade contractors	19,771	269	1.4%	4,344	22.0%	7,385	37.4%
<b>TOTAL</b>		<b>261,617</b>	<b>97,169</b>	<b>37.1%</b>	<b>143,075</b>	<b>54.7%</b>	<b>182,028</b>	<b>69.6%</b>

<sup>a</sup> Data below the 3-digit NAICS (i.e., for NAICS 2331 Land development and subdevelopment) not publishable.

<sup>b</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

<sup>c</sup> Figures may be low due to lack of sufficient data for NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) for values under \$250,000.

Figures may not add to totals due to rounding.

Source: U.S. Census Bureau (2000a).

The overall average level of receipts among nonemployer establishments is \$81,000 versus \$1.98 million for establishments with payrolls. A recent study by the Joint Center for Housing Studies of

Harvard University indicates that a substantial number of the nonemployer establishments—at least 141,000 of those classified as general building contractors (NAICS 233)—are actually remodelers (Joint Center 2001).<sup>7</sup> The Joint Center estimates do not account for nonemployer establishments outside NAICS 233 (i.e., NAICS 234 (Heavy construction) or 235 (Special trades). As discussed further in Section 2.3.2, EPA has reviewed available data on such *nonemployer* establishments and concluded that most are unlikely to be affected by the proposed rules.

### **2.3.1.2 Legal Form of Organization**

The Census Bureau defines construction establishments according to how they are organized legally, using the following classification scheme: (a) corporations, (b) proprietorships, (c) partnerships, and (d) other. In 1997, a total of 173,602 C&D establishments with payrolls (66.4 percent of the total) were organized as corporations (see Table 2-7). A further 64,733 (24.7 percent) were organized as proprietorships while 14,313 (5.5 percent) operated as partnerships and 8,969 (3.5 percent) operated under some other legal form of organization. Organization as a corporation is most prevalent in NAICS 2331 (Land subdivision and development), at 76.6 percent, and least prevalent in NAICS 235 (Special trade contractors), at 61.6 percent. See Appendix 2A for more detailed industry-level data.

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<sup>7</sup> The estimate of 141,000 establishments is probably an underestimate. The Joint Center applied the percentage of establishments with payrolls known to be remodelers to the nonemployer establishments. In practice, remodelers probably account for a larger percentage of nonemployer establishments than employer establishments. As the report states, “(o)ur procedures thus generate a conservative estimate of the number of businesses concentrating their activities in residential remodeling” (Joint Center, 2001, p. 35).

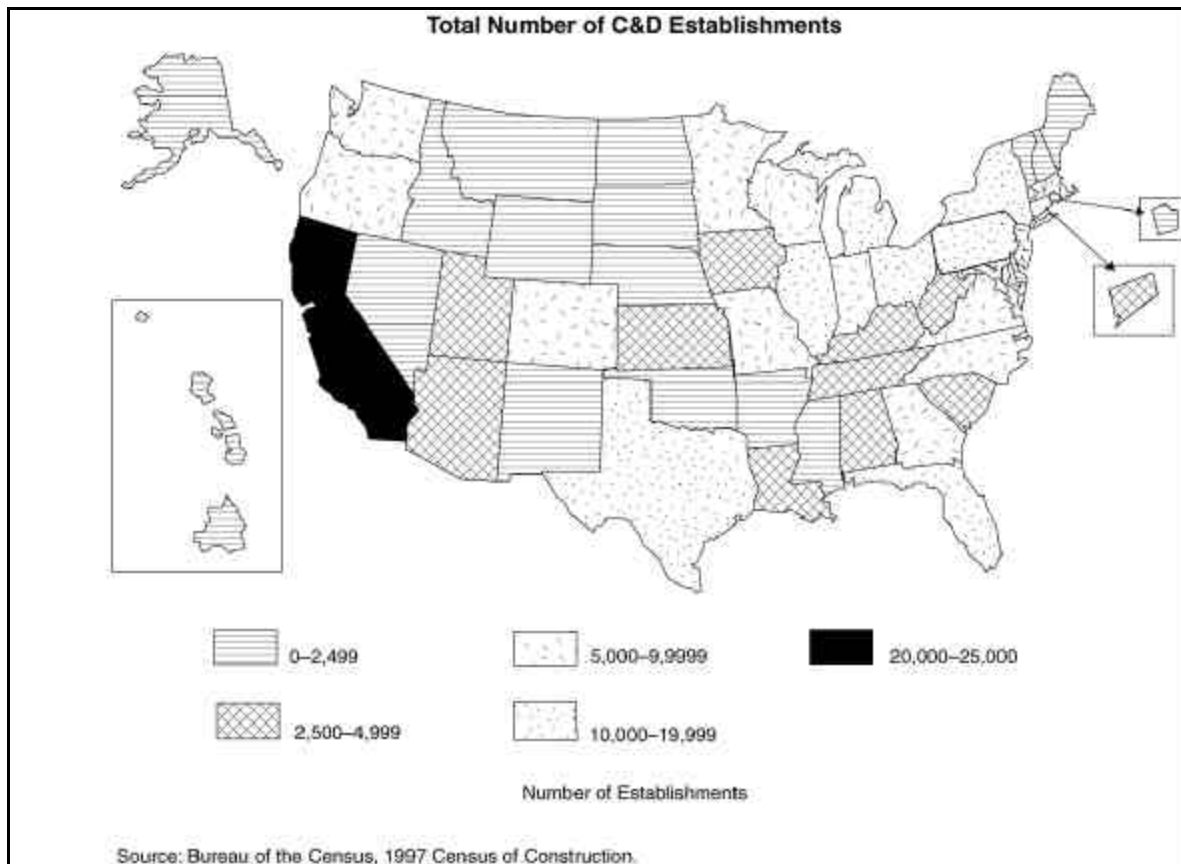
**Table 2-7**  
**Number of Establishments in the Construction and Development Industry with Payrolls, by Legal Form of Organization**

NAICS	Description	Corporations		Proprietorships		Partnerships		Other		Total	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
233	Building, developing, and general contracting, except land subdivision and development (2331)	124,475	65.1%	50,235	26.3%	9,827	5.1%	6,567	3.4%	191,104	100.0%
2331	Land subdivision and development	6,268	76.6%	327	4.0%	1,323	16.2%	267	3.3%	8,185	100.0%
234	Heavy construction	30,682	72.1%	8,401	19.7%	2,115	5.0%	1,359	3.2%	42,557	100.0%
235 <sup>a</sup>	Special trade contractors	12,177	61.6%	5,770	29.2%	1,048	5.3%	776	3.9%	19,771	100.0%
<b>TOTAL</b>		<b>173,602</b>	<b>66.4%</b>	<b>64,733</b>	<b>24.7%</b>	<b>14,313</b>	<b>5.5%</b>	<b>8,969</b>	<b>3.5%</b>	<b>261,617</b>	<b>100.0%</b>

<sup>a</sup>Covers establishments in NAICS 23593 (Excavation Contractors) and 23594 (Wrecking and Demolition Contractors) only.  
Source: U.S. Census Bureau (2000a).

**2.3.1.3 Geographic Distribution**

Figure 2-1 shows a geographic distribution of establishments by state. The largest concentrations of establishments are in California, New York, Texas, Florida, and Pennsylvania. Combined, these states account for approximately 25 percent of all C&D establishments nationwide.



**Figure 2-1. Number of establishments in the C&D industries, by state, 1997.**

**2.3.1.4 Employment**

In 1997, establishments with payrolls in the C&D industries employed a total of nearly 2.4 million workers. Table 2-8 shows a distribution of employment by NAICS industry. NAICS 2331 (Land subdivision and land development) accounts for 41,827 employees (1.8 percent of the total), the rest of

NAICS 233 (Building, developing, and general contracting) accounts for 1.3 million employees, or 55.2 percent of the total. A total of 880,400 or 37.3 percent of the total are employed in NAICS 234 (Heavy construction), and NAICS 23593 and 23594 (Excavation contractors and Wrecking/demolition contractors) employ 135,057 (5.7 percent of the total).

**Table 2-8**  
**Number of Employees in the Construction and Development Industries Establishments With Payrolls, 1997**

NAICS	Industry	Number of Employees	Percent of Total
233, except 2331	Building, developing, and general contracting, except land subdivision and land development	1,301,126	55.2%
2331	Land subdivision and land development	41,827	1.8%
234	Heavy construction	880,400	37.3%
235 <sup>a</sup>	Special trade contractors	135,057	5.7%
<b>TOTALS</b>		<b>2,358,410</b>	<b>100.0%</b>

<sup>a</sup> Includes NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.  
Source: U.S. Census Bureau (2000a).

Construction is a seasonal activity in many parts of the country, and employment data from the industry bear this out. Figure 2-2 shows quarterly employment data for all NAICS in the C&D industries, as well as the annual average. Overall, employment of construction workers was lowest in March at 1.59 million and highest in August at 1.83 million.



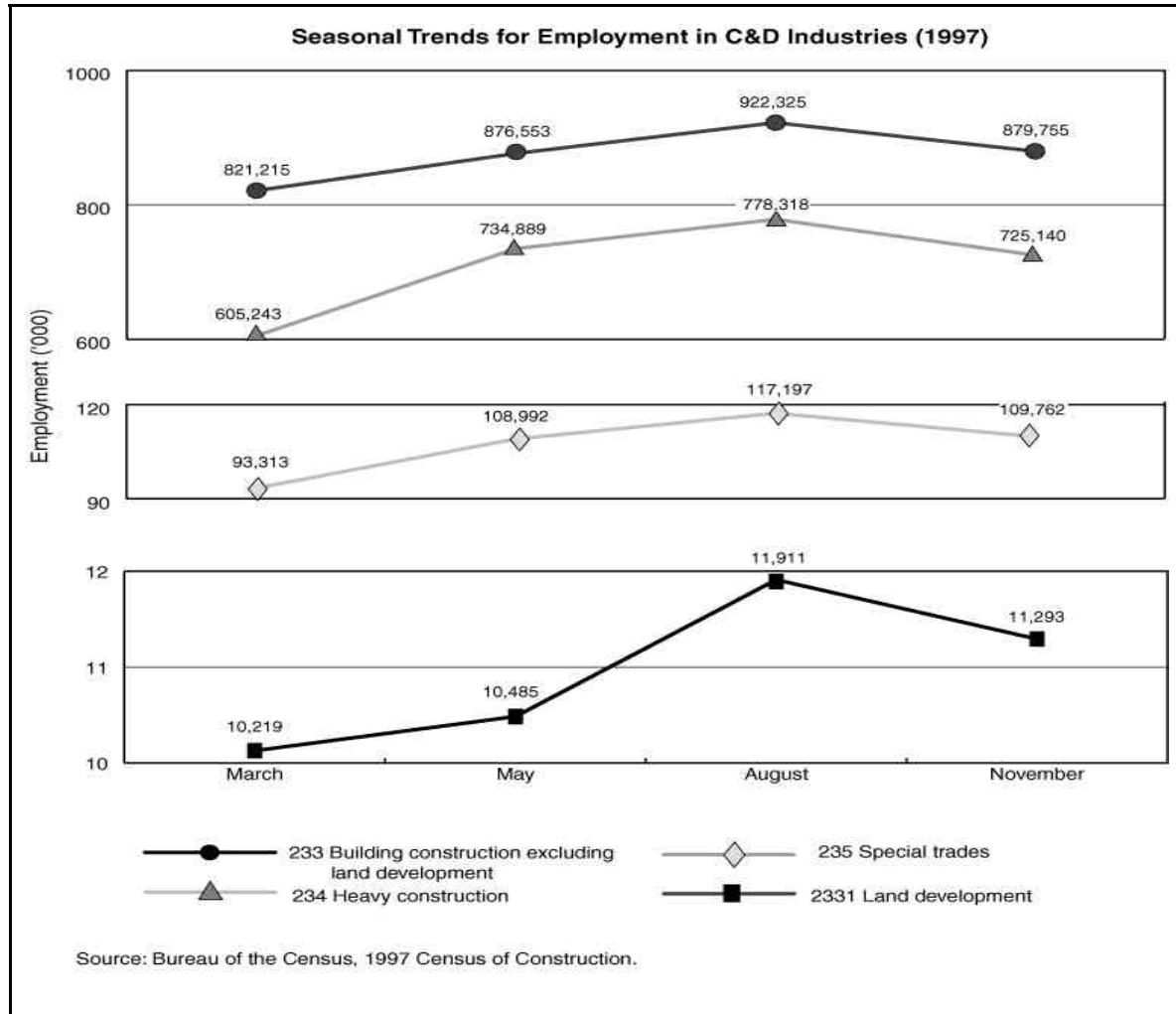


Figure 2-2. Seasonal trends for employment in the C&D industries, 1997.

### 2.3.1.5 Payrolls and Benefits

In 1997, the payrolls of all C&D industries totaled \$76.8 million (see Table 2-9). Of this number \$48.3 million (62.9 percent) went to construction workers and \$28.5 million (37.1 percent) went to other

employees.<sup>8</sup> In addition, the C&D industries incurred \$11.2 million in legally required fringe benefit expenditures and \$6.5 million in voluntary fringe benefits, for a total of \$17.6 million in fringe benefits.<sup>9</sup> Table 2-9 shows detailed data on payrolls and benefits for each of the C&D industries.

### 2.3.1.6 Specialization

Specialization in the C&D industries refers to the percent of establishment revenues earned from different types of construction activity. Specialization data provide some insight into the homogeneity of businesses classified within the same NAICS industry. When reporting to Census, an establishment self-reports its own degree of specialization by type of construction, based on the percentage of revenue earned from each type of construction work. Table 2-10 shows, as an example, the specialization of establishments in NAICS 23321 (Single-family home construction) across the “type of construction” categories defined by the Census Bureau, and the revenues earned by establishments in each specialization category.<sup>10,11</sup>

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<sup>8</sup> *Construction workers* include all workers up through the working supervisor level directly engaged in construction operations, such as painters, carpenters, plumbers, and electricians. Included are journeymen, mechanics, apprentices, laborers, truck drivers and helpers, equipment operators, and on-site recordkeepers and security guards. *Other employees* include employees in executive, purchasing, accounting, personnel, professional, technical activities, and routine office functions.

<sup>9</sup> *Legally required contributions* include Social Security contributions, unemployment compensation, workman's compensation, and State temporary disability payments. *Voluntary expenditures* include life insurance premiums, pension plans, insurance premiums on hospital and medical plans, welfare plans, and union negotiated benefits.

<sup>10</sup> Due to high degrees of variation of specialization and types of construction among NAICS sectors, detailed tables for each NAICS in the C&D industries are presented separately in Appendix 2B.

<sup>11</sup> Because the Census Bureau only considers construction establishments to be specialized if they earn more than half of their revenues from one particular type of construction, the total value of construction work shown in these tables will not match industry totals, which cover all establishments, including those that are not specialized.

**Table 2-9**  
**Payrolls and Benefits for Employees in the Construction Industry (Thousands of 1997 Dollars)**

NAICS	Industry	Payrolls <sup>a</sup>			Fringe Benefits (All Employees)		
		Construction workers <sup>b</sup>	Other employees <sup>c</sup>	All employees <sup>d</sup>	Legally required expenditures <sup>e</sup>	Voluntary expenditures <sup>f</sup>	Total fringe benefits <sup>g</sup>
233	<i>Building, developing, and general contracting</i>	\$23,135,832	\$19,410,280	\$42,546,112	\$5,929,710	\$3,011,115	\$8,940,824
23311	Land subdivision and land development	\$254,247	\$1,255,526	\$1,509,773	\$164,669	\$71,648	\$236,317
23321	Single-family housing construction	\$7,739,858	\$7,224,726	\$14,964,583	\$2,000,118	\$623,079	\$2,623,197
23322	Multifamily housing construction	\$1,022,265	\$744,361	\$1,766,627	\$255,879	\$76,644	\$332,523
23331	Manufacturing and industrial building construction	\$3,322,347	\$1,806,620	\$5,128,967	\$777,829	\$446,522	\$1,224,351
23332	Commercial and Institutional building construction	\$10,797,116	\$8,379,046	\$19,176,160	\$2,731,214	\$1,793,222	\$4,524,436
234	<i>Heavy construction</i>	\$22,218,582	\$8,073,267	\$30,291,850	\$4,665,757	\$3,120,979	\$7,786,736
23411	Highway and street construction	\$7,095,139	\$2,432,488	\$9,527,626	\$1,507,465	\$1,109,177	\$2,616,641
23412	Bridge and tunnel construction	\$1,378,759	\$468,401	\$1,847,160	\$344,821	\$263,297	\$608,117
23491	Water, sewer, and pipeline construction	\$4,087,007	\$1,435,273	\$5,522,281	\$844,394	\$493,761	\$1,338,155
23492	Power and communication transmission line construction	\$1,748,715	\$638,717	\$2,387,432	\$374,145	\$231,538	\$605,683
23493	Industrial nonbuilding structure construction	\$2,734,020	\$988,343	\$3,722,363	\$486,625	\$302,813	\$789,439
23499	All other heavy construction	\$5,174,943	\$2,110,046	\$7,284,989	\$1,108,307	\$720,394	\$1,828,701
235 <sup>h</sup>	<i>Special trade contractors</i>	\$2,940,440	\$1,005,609	\$3,946,050	\$582,157	\$329,925	\$912,082
23593	Excavation contractors	\$2,525,857	\$828,017	\$3,353,874	\$483,764	\$283,952	\$767,716
23594	Wrecking and demolition contractors	\$414,583	\$177,592	\$592,176	\$98,393	\$45,973	\$144,366
<b>TOTAL</b>		<b>\$48,294,854</b>	<b>\$28,489,156</b>	<b>\$76,784,012</b>	<b>\$11,177,624</b>	<b>\$6,462,019</b>	<b>\$17,639,642</b>

<sup>a</sup> Payrolls includes the gross earnings paid in the calendar year 1997 to all employees on the payrolls of construction establishments. It includes all forms of compensation such as salaries, wages, commissions, bonuses, vacation allowances, sick leave pay, prior to such deductions as employees' Social Security contribution, withholding taxes, group insurance, union dues, and savings bonds.

<sup>b</sup> Construction workers include all workers up through the working supervisor level directly engaged in construction operations, such as painters, carpenters, plumbers, and electricians. Included are journeymen, mechanics, apprentices, laborers, truck drivers and helpers, equipment operators, and on-site recordkeepers and security guards.

<sup>c</sup> Other employees include employees in executive, purchasing, accounting, personnel, professional, technical activities, and routine office functions.

<sup>d</sup> Sum of construction workers and other employees.

<sup>e</sup> Legally required contributions include Social Security contributions, unemployment compensation, workman's compensation, and State temporary disability payments.

<sup>f</sup> Voluntary expenditures include life insurance premiums, pension plans, insurance premiums on hospital and medical plans, welfare plans, and union negotiated benefits.

<sup>g</sup> Total fringe benefits represent the expenditures made by the employer during 1997 for both legally required and voluntary fringe benefit programs for employees.

<sup>h</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Source: U.S. Census Bureau (2000a).

Specialized establishments in NAICS 23321 (i.e., those that earn 51 percent or more of revenues from one type of construction) may be specialized in either detached single-family housing construction or attached single-family housing construction.<sup>12</sup> The number of construction type specializations may depend on the NAICS, as some industry definitions encompass a broader set of construction activities (see Appendix 2B). Within NAICS 23321, establishments specialized 51 percent or more in detached, single-family housing construction performed construction work valued at \$127.9 billion. Establishments 100 percent specialized in detached, single-family housing construction performed construction work worth \$90.4 billion, or 64.4 percent of all work done by establishments with specialization in construction work. Similarly, for establishments specializing in construction of attached single-family houses by 51 percent or more, the value of work was \$12.5 billion, and 52.8 percent of the work (\$6.6 billion) was done by establishments with complete specialization in attached single-family houses. Further analysis of the value of construction work performed by the C&D industries can be found in Section 2.7.1.

**Table 2-10**  
Specialization within NAICS 23321 (Single-Family Home Construction), Categorized by Value of Construction Work  
(Millions of 1997 Dollars)

Type of Construction with Specialization	Estabs. spec. 51 % or more	Estabs. with 100 % spec.	Estabs. with 90 to 99 % spec.	Estabs. with 80 to 89 % spec.	Estabs. with 70 to 79 % spec.	Estabs. with 60 to 69 % spec.	Estabs. with 51 to 59 % spec.
Single-family houses, detached	\$127,870	\$90,434	\$14,615	\$7,040	\$6,600	\$6,603	\$2,574
Single-family houses, attached, including townhouses and townhouse-type condominiums	\$12,534	\$6,623	\$1,292	\$877	\$1,074	\$1,693	\$971

Source: U.S. Census Bureau (2000a).

<sup>12</sup> Although they may earn revenues from other types of construction (e.g., highway construction) they would no longer be classified in NAICS 23321 if they earned 51 percent or more of their revenue from such sources.

### 2.3.2 Firm-Level Data

The SBA Office of Advocacy contracts with the U.S. Census Bureau to produce firm-level data for U.S. industries. Currently, distributions by employment size are available on an NAICS basis for 1998, and distributions by receipt size are available on an SIC basis for 1997.

The SBA data is based primarily on administrative records and is not generated in conjunction with, nor is it linked to, data collected through the Census of Construction. As a result, there may be minor inconsistencies between data reported by SBA and that reported by the Census of Construction.<sup>13</sup> The SBA/Census data, however, is the *only* firm-level data available for C&D industries, so EPA is including it in this analysis because it is valuable to the economic modeling and the small entity analysis, which applies at the firm, not the establishment, level.<sup>14</sup>

#### 2.3.2.1 Number and Size of Firms

Table 2-11 presents the number of firms with payrolls (firms with paid employment) and number of establishments in the C&D industries in 1998.<sup>15</sup> These data indicate that a majority of firms operate a single establishment, and have fewer than 20 employees. Of the 215,301 C&D firms in 1998; approximately 99 percent of these operate only one establishment, and 94 percent have fewer than 20 employees; less than 1 percent of firms have more than 500 employees. In 1998, there were 39,062 firms in heavy construction and these operated 40,091 establishments. More than 97 percent of the heavy

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<sup>13</sup> For example, the SBA data provide estimates of the number of establishments operated by C&D firms. These establishment counts, however, do not match those reported in the Census of Construction. This is partially due to differences in coverage (the SBA data include administrative establishments while the Census of Construction does not) as well as differences in data collection methods.

<sup>14</sup> For clarification, an *establishment* is defined as “a relatively permanent office or other place of business where the usual business activities related to construction are conducted” (Census, 2000a). A *firm* refers to the aggregation of all establishments owned by one company; therefore one firm may consist of several establishments.

<sup>15</sup> “The data excludes non-employer businesses, thus excluding many self-employed individuals (employment is measured in March so firms starting after March, firms closing before March and seasonal firms can have zero employment).” SBA Office of Advocacy website, <http://www.sba.gov/advo/stats/data.html>.

construction firms operate a single establishment and approximately 79 percent of heavy construction firms have fewer than 20 employees.

**Table 2-11**  
**Employer Firms and Establishments by Employment Size of Firm by NAICS Codes, 1998 – SBA Data**

Industry	NAICS	Firms					Establishments				
		Total	0	<20	<500	500+	Total	0	<20	<500	500+
<i>Building, developing, &amp; general contracting</i>	233	215,301	38,904	202,969	214,921	380	216,893	38,907	203,020	215,478	1,415
Land subdivision & land development	23310	11,192	2,829	10,618	11,101	91	11,369	2,832	10,628	11,179	190
Single-family housing const.	23321	153,029	29,168	149,240	152,937	92	153,561	29,168	149,253	153,108	453
Multifamily housing const.	23322	8,054	1,405	7,413	8,027	27	8,091	1,405	7,414	8,041	50
Mfg & industrial building construction	23331	6,842	720	5,470	6,775	67	6,904	720	5,471	6,784	120
Commercial & institutional building construction	23332	36,355	4,782	30,240	36,158	197	36,968	4,782	30,254	36,366	602
<i>Heavy construction</i>	234	39,062	4,589	30,987	38,788	274	40,091	4,589	31,010	39,098	993
Highway & street const.	23411	10,884	1,493	8,265	10,806	79	11,268	1,493	8,273	10,901	367
Bridge & tunnel construction	23412	886	70	520	865	21	925	70	521	880	45
Water, sewer, & pipeline construction	23491	7,749	676	5,786	7,704	45	7,823	676	5,787	7,726	97
Power & communication transmission line construction	23492	3,170	404	2,464	3,133	37	3,305	404	2,465	3,157	148
Industrial nonbuilding structure construction	23493	641	52	411	575	66	709	52	411	583	126
All other heavy construction	23499	15,860	1,894	13,541	15,758	102	16,061	1,894	13,553	15,851	210
<i>Excavation contractors</i>	23593	23,209	4,310	22,145	23,201	8	23,240	4,310	22,145	23,223	17
<i>Wrecking &amp; demolition contractors</i>	23594	1,336	247	1,094	1,329	7	1,344	247	1,094	1,332	12

Source: U.S. Small Business Administration (1998), based on data provided by the U.S. Census Bureau.

### 2.3.2.2 Firm-Level Revenues

Table 2-12 shows the number of employer firms and establishments, in 1997, based on NAICS industry and revenue size class. These data also show that a large number of firms in the C&D industries

are small. Approximately three-quarters (75.2 percent) of the firms in the target industry sectors reported under \$1.0 million in revenues for 1997 and nearly 94 percent of firms reported revenues under \$5.0 million.

**Table 2-12**  
**Firms and Establishments with Payrolls by Revenue Size Class (1997)<sup>a</sup> (SBA Data)**

Description	FIRMS							ESTABLISHMENTS <sup>b</sup>						
	Total Number of Firms	< \$1 Million	< \$5 Million	< \$7.5 Million	< \$25 Million	< \$100 Million	Over \$100 Million	Total Establishments	< \$1 Million	< \$5 Million	< \$7.5 Million	< \$25 Million	< \$100 Million	Over \$100 Million
Land Subdivision and Development	11,036	7,744	10,207	10,501	10,851	10,948	88	11,205	7,746	10,218	10,514	10,896	11,018	186
Single-Family Housing Construction	149,130	123,414	145,305	146,917	148,634	148,975	155	149,823	123,420	145,339	146,962	148,736	149,161	661
Multifamily Housing Construction	6,911	5,128	6,347	6,518	6,791	6,877	34	7,009	5,129	6,354	6,527	6,810	6,910	99
Manufacturing and Industrial Building Construction	7,950	4,674	6,841	7,156	7,692	7,879	71	8,075	4,675	6,847	7,166	7,713	7,914	160
Commercial and Institutional Building Construction	38,195	22,518	32,523	34,085	36,964	37,882	313	39,044	22,526	32,560	34,133	37,075	38,124	920
Highway and Street Construction	10,778	5,683	8,681	9,291	10,320	10,679	99	11,117	5,683	8,689	9,302	10,349	10,758	359
Bridge and Tunnel Construction	875	287	583	638	788	847	28	915	288	584	640	795	859	56
Water, Sewer, and Pipeline Construction	7,916	4,475	6,861	7,245	7,768	7,883	33	8,075	4,476	6,864	7,251	7,791	7,938	137
Power and Communication Transmission Line Construction	2,781	1,572	2,411	2,546	2,729	2,770	11	2,837	1,572	2,412	2,548	2,738	2,789	48
Industrial Nonbuilding Structure Construction	3,941	2,786	3,612	3,713	3,860	3,909	32	4,023	2,787	3,617	3,720	3,874	3,936	86
All Other Heavy Construction	12,973	9,110	11,873	12,213	12,697	12,863	111	13,594	9,118	11,920	12,279	12,814	13,087	507
Excavation Contractors	22,046	19,093	21,659	21,820	22,002	22,038	8	22,072	19,093	21,661	21,823	22,005	22,055	17
Wrecking and Demolition Contractors	1,270	840	1,165	1,204	1,249	1,261	9	1,285	840	1,166	1,205	1,252	1,271	14
<b>TOTAL</b>	<b>275,802</b>	<b>207,324</b>	<b>258,068</b>	<b>263,847</b>	<b>272,345</b>	<b>274,811</b>	<b>992</b>	<b>279,074</b>	<b>207,353</b>	<b>258,231</b>	<b>264,070</b>	<b>272,848</b>	<b>275,820</b>	<b>3,250</b>

<sup>a</sup> Data are for 1997. SBA does not report revenue size class data in NAICS format and will not do so until the 2002 Economic Census is published. These figures were calculated using percentages provided in the Census Bureau's NAICS to SIC bridge, which is available at [www.census.gov/epcd/ec97brdg.HTM](http://www.census.gov/epcd/ec97brdg.HTM).

<sup>b</sup> The number of establishments reported here may differ from the number reported in previous tables due to the different sources used (see Table 2-2 and accompanying text for further discussion). Earlier tables are based on data from the 1997 Economic Census; Table 2-12 is based on 1997 data from SBA/Census and was converted from SIC to NAICS for the purposes of this analysis. Source: SBA 1998



### 2.3.3 Number of Small Entities

Small entities are defined by the SBA according to size standards based on either number of employees or annual revenue (13 CFR 121). For all of the C&D industries, the size standards are based on annual revenues. Table 2-13 presents the SBA revenue thresholds for the C&D industry, which range from \$5.0 million for NAICS 233110 (Land subdivision and land development) to \$27.5 million for the majority of NAICS 233 (Building, developing, and general contracting) and NAICS 234 (Heavy construction). An estimated 189,805 C&D businesses, representing 99.5 percent of all businesses in the C&D industry, fall below the SBA-defined revenue thresholds for this industry and therefore may be qualified as small businesses. Table 2-13 shows the total estimated number of businesses and total small businesses in the C&D industry; the number of potentially affected small businesses is developed in Chapter Six.

**Table 2-13**  
**Number of Firms and Establishments Above and Below SBA Thresholds for Small Business Definition:**  
**Based on Data from SBA**

NAICS	SBA Revenue Threshold (million \$)	Total Estimated Number of Businesses	Estimated Number of Small Businesses	Small Businesses as a Percent of Total
233210: Single-family Housing Construction	\$27.5	138,732	138,583	99.9%
233220: Multifamily Housing Construction	\$27.5	7,534	7,491	99.4%
233310: Manufacturing and Industrial Building Construction	\$27.5	7,257	7,050	97.1%
233320: Commercial and Institutional Building Construction	\$27.5	37,220	36,681	98.6%
<b>TOTAL</b>	–	<b>190,743</b>	<b>189,805</b>	<b>99.5%</b>

<sup>a</sup> For those industries with a \$27.5 million SBA cutoff, the table shows the number of firms and establishments with revenues below \$25.0 million (the next closest SBA data break point). For industries with a \$11.5 million SBA cutoff, figures shown are for firms and establishments with revenues below \$7.5 million.

Source: SBA 1998; also see Chapter Six, Tables 6-2 and 6-3

### **2.3.4 Entities Not Covered by the Proposed Rule**

Not all establishments and firms that fall within the industry definitions outlined in the previous sections will be affected by the proposed rule. The proposed rule will apply only to those NPDES-permitted establishments engaged in activities that disturb land. EPA believes that some entities will be excluded from regulatory coverage because they are primarily engaged in remodeling activities that will not result in land disturbance. Others will be excluded because they are generally not the primary NPDES permit holder. As discussed in Section VI.A in the preamble of the proposed rule, Special trade contractors are typically not identified as NPDES permit holders and thus will not likely be covered by the proposed rule. In this section EPA estimates the number of establishments that fall into these categories. The resulting estimates are brought together in Section 2.3.5 to derive the number of establishments covered under each option of the proposed rule.

#### ***2.3.4.1 Establishments Engaged in Remodeling***

Two sources provide information on the potential number of C&D establishments that are actually remodelers. In an article published in *Housing Economics*, NAHB economists estimated that in 1997 approximately 45,952 establishments in the residential building industry were involved in *remodeling activities only* (Ahluwalia and Chapman, 2000). This count is based on analysis of Census microdata on establishments, receipts, and source of receipts. Establishments were classified as remodelers in this study if they earned *100 percent* of revenues from remodeling activities.

The Joint Center for Housing Studies at Harvard University recently published a report focused solely on the remodeling industry (Joint Center, 2001). This report classified establishments that derive *at least half* of their revenues from remodeling activities as remodelers. When defined in this manner, the study found that 62,400 establishments classified as general contractors/builders in 1997 were actually remodelers.

Both of these estimates are based on establishments classified by Census as *general contractors/builders*. The Joint Center study goes further to identify establishments classified in various special trades (e.g., Carpentry, Plumbing) that are primarily engaged in remodeling, but these estimates

do not include those considered part of the C&D industries (i.e., NAICS 23593 Excavation contractors and 23594 Wrecking and demolition contractors).<sup>16</sup> NAHB does not address the issue of special trades contractors in their report. Neither report estimates the number of establishments in NAICS 234 (Heavy construction) that may be engaged primarily in remodeling activities; however, EPA does not expect that establishments in the heavy construction sector would be engaged in remodeling activities.

Following review of these studies, EPA used the estimate from the Joint Center study as the best estimate of the number of remodelers included in statistics of the C&D industries. This study defines remodelers as establishments that earn at least 50 percent of revenues from remodeling activity (and thus earn less than 50 percent from building activity). EPA concludes that these establishments, when engaged in building activity, are unlikely to disturb more than one acre of land and would therefore not be covered by the proposed rule.

#### ***2.3.4.2 Establishments That Are Not NPDES Permittees***

EPA has included in the universe of potentially affected establishments all establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) because such establishments engage in land disturbing activities. In reality, however, establishments in these industries generally act as subcontractors on C&D projects and are hired by developers or general contractors to perform specific tasks. EPA does not believe that such establishments generally appear as NPDES permittees or copermitees. Therefore, while these establishments are included among the universe of potentially affected establishments (and appear below in Table 2-14), EPA has not included them in the subsequent economic impact analysis chapters (i.e., Chapters Four, Five, and Six).

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<sup>16</sup> The Joint Center study does provide an estimate for the number of remodelers classified in “miscellaneous special trades” (NAICS 2359), which includes NAICS 23593 and 23594, but several other industries as well. The number of remodelers classified primarily in NAICS 23593 and 23594 may not be large, however, since the total number in NAICS 2359 is only 6,600.

### 2.3.5 Number of Potentially Affected Entities

EPA took several steps to adjust the number of affected entities to account for regulatory coverage and data availability. Previous sections estimated that the total number of establishments in the C&D industry is 261,617 (see Table 2-4). Subtracting the 62,400 remodeling establishments estimated in Section 2.3.4 from this figure yields a *potentially affected* universe of 199,214 establishments. EPA subtracted the 62,400 residential remodeling establishments from the single-family and multifamily building construction industries (NAICS 23321 and NAICS 23322), based on their respective shares of residential building establishments.

In preparing its economic impact analysis, EPA concluded that data limitations on land developers (NAICS 2331) would preclude retaining this as a separate industry for purposes of regulatory analysis.<sup>17</sup> Rather than excluding establishments in this industry category (which would potentially underestimate the number of affected entities and associated impacts) EPA distributed them among the four building construction industries (single-family, multifamily, commercial, and industrial construction), based on each industry's share of total establishments.<sup>18</sup> Table 2-14 reflects this allocation, which was done after removing those establishments engaged primarily in remodeling.

EPA has further adjusted the population of affected establishments to account for differences in regulatory coverage. As described in Chapter Three, the proposed rule considers three erosion and sediment control (ESC) options. Option 1 would apply to sites that disturb one acre or more of land, while Option 2 would apply to sites that disturb five acres or more of land. Option 3 is a no regulation option, meaning that no sites or establishments would be affected.

EPA used data from the Census Bureau and other sources to define an average housing density for the nation as a whole (average number of housing units per acre), then used this analysis to identify classes of establishments that would be excluded based on their likelihood of disturbing less than one acre (Option 1) or five acres (Option 2) on a project basis. EPA believes these estimates to be

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<sup>17</sup> Specifically, EPA could not obtain equivalent financial data with which to build financial models of the land development industry.

<sup>18</sup> EPA provides further justification for and details about this step in the analysis in Chapter Four.

conservative in terms of identifying establishments unaffected by the proposed rule. First, while the regulatory threshold applies to each *site*, EPA excluded establishments if the estimated number of acres disturbed *in a year* is below the regulatory threshold. In addition, the analysis was not adjusted for the percent of sites normally left undisturbed.<sup>19</sup>

Based on this analysis, EPA assumed that establishments in the single-family building construction industry (NAICS 2331) that complete between 1 and 4 housing units each year would be excluded under Option 1. Under Option 2, EPA also assumed that establishments in the single-family building construction industry (NAICS 2331) that complete between 5 and 9 housing units, as well as establishments in the multifamily building construction industry (NAICS 2332) that complete between 2 and 9 housing units each year, would be excluded. Chapter Four contains further detail on the data sources and method used to make this adjustment.

Table 2-14 shows the distribution of establishments potentially affected under Option 1 and 2, following the redistribution of land developers (NAICS 2331) and adjustment for small builders exempt from the site size limitations of each option. Due to limited data, the number of establishments in NAICS 234 (Heavy construction) and NAICS 235 (Special trades) affected under each option could not be refined further, so no adjustments are made to these establishment counts. Moreover, as discussed in Section XII of the preamble of the proposed rule, special trade contractors are not included in Chapter 5, Economic Impact Analysis Results of this report. Special trade contractors are typically subcontractors and are not NPDES permittees. Therefore, these contractors would not be directly affected by the proposed rule.

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<sup>19</sup> For example, an establishment that completes 15 houses per year is estimated to account for 5.6 acres of converted land, based on the average housing density of 2.67 new single-family housing units per acre. EPA would include this establishment among those covered under Option 2, even though the actual area disturbed may well fall below 5 acres once open space, buffers, and other “undisturbed” areas are factored in. Furthermore, as noted, EPA assumes that all of the housing units are covered by a single NPDES permit while in reality the establishment might operate on more than one site, none of which exceeds the 5-acre threshold.

**Table 2-14. Number of Affected Establishments in the Construction and Development Industry**

NAICS	Industry	Option 1		Option 2	
		Number	Percent of Total	Number	Percent of Total
23321	Single-family residential building construction	34,070	22.9%	21,362	15.9%
23322	Multi-family residential building construction	4,603	3.1%	2,699	2.0%
23331	Manufacturing and industrial building construction	7,742	5.2%	7,742	5.8%
23332	Commercial and institutional building construction	39,810	26.8%	39,810	29.7%
234	Heavy construction	42,557	28.6%	42,557	31.8%
235 <sup>a</sup>	Special trade contracting	19,771	13.3%	19,771	14.8%
<b>Potentially affected establishments</b>		<b>148,553</b>	<b>100.0%</b>	<b>133,941</b>	<b>100.0%</b>

<sup>a</sup> Includes NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Figures may not add to totals due to rounding.

Source: U.S. Census Bureau (2000a) and EPA estimates.

## 2.4 MARKET SUPPLY AND DEMAND

The sections below discuss the supply and demand factors that affect the residential, nonresidential, and heavy construction industries. This discussion provides insight into the dynamics of the construction market and provides a basis for many of the key assumptions used in the economic impact models.

## 2.4.1 Characteristics of Construction Supply

This section discusses the factors that influence supply in the C&D industry. Topics include number and value of residential, nonresidential, and heavy construction projects; barriers to entry in the industry; and supply trends (the latter primarily for the residential construction market).

### 2.4.1.1 Residential Building

#### Number of Projects

The Census Bureau operates three data collection programs that track and report output measures relevant for the C&D industry:

- The *Building Permits Program* collects monthly information on building permits issued for new private residential construction.
- The *Survey of Construction* collects information on residential units started, sold, and completed each month. Several data series are produced from this program. These include:
  - *Housing Starts* (Series C20)—Provides monthly data on the number of housing starts, including number of housing units authorized, started, and authorized but not yet started.
  - *New One-Family Houses Sold* (Series C25)—Provides monthly data on units sold and for sale, average and median sales prices, and price distribution of units sold. This series also produces the Price Index of New One-Family Houses Sold.
  - *Characteristics of New Housing* (Series C25A)—Compiles and publishes data annually on housing prices and physical characteristics such as size of unit, number of bathrooms, type of heating system, and type of exterior wall.
  - *Housing Completions* (Series C22)— This series, published monthly, provides data on the number of housing units completed in a month and on those under construction.

- *New Residential Construction in Selected Metropolitan Areas* (Series C21)—Provides quarterly data by metropolitan area on units authorized, started, and completed.<sup>20</sup>
- *The Value Put in Place* program publishes estimates of the value of construction work performed each month.

Combined, these data programs produce vast amounts of information on construction industry output. This profile focuses on building permits, since the activities most likely to be influenced by the proposed effluent guidelines regulations are those that take place early in the development process. The following discussion and supporting tables provide further details about the building permits data collection program.

The Building Permits Program collects data on private *residential* construction authorized by building permits based upon reports submitted by local building permit officials.<sup>21</sup> The data include the number of permits authorized by type<sup>22</sup> and the value of permits. These reports are provided in response to a mail survey using Form C-404 “Report of Building or Zoning Permits Issued and Local Public Construction.” The mail survey covers a sample of 8,500 permit-issuing places from a universe of 19,000 in the U.S.<sup>23</sup> Approximately 96 percent of all privately owned housing units are built in areas that require building permits.

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<sup>20</sup> Census has discontinued publication of this series. The last year for which data were published was 1998.

<sup>21</sup> Census discontinued collection of data on *nonresidential construction* authorized by building permits in 1995 due to budget cuts. EPA has used historical data from this series to create projections of nonresidential building activity beyond 1995. See Section 2.6.1.2.

<sup>22</sup> Private residential construction is classified as: single-family homes, 2-family buildings, 3-4 family buildings, or 5 or more family buildings. Data collection for other types of construction (including nonresidential housekeeping, nonresidential buildings, and demolition and razing) was discontinued in 1995.

<sup>23</sup> All permit-issuing places in the most active MSAs and all CMSAs are selected with certainty for the sample. The remaining places are stratified by State into two strata based on the number of housing units authorized in 1989, 1990, 1991, and 1992. In each State, all places that authorized housing units during the period greater than or equal to a predetermined number of units were selected with certainty. The other places were selected at the rate of 1 in 10.



Figure 2-3 shows monthly data from January 1994 through July 2000 on the number of housing units authorized by building permit. The data in this chart represent seasonally adjusted annual averages. Seasonal adjustment eliminates the effect of changes that normally occur at about the same time and with about the same magnitude every year.<sup>24</sup> As seen, the seasonally adjusted annual rate of building permits issued shows a steady rise over the recent period. From an average of between 1.3 and 1.5 million units per year over the 1994 to 1997 period, the rate then rose through the 1998 to 2000 period. The rate appears to have reached a peak in January 2000 when it hit 1.7 million units, and has since fallen steadily back to approximately 1.5 million units per year.

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<sup>24</sup> This includes the influence of factors such as normal or average changes in weather conditions, differences in the lengths of the months, and differences in the composition (trading-day variation) of the months. The seasonally adjusted annual rate is the seasonally adjusted monthly rate multiplied by 12. The seasonally adjusted annual rate for a particular month, for example July, can be interpreted to mean that if the only changes which occur in building permits from July through June of the following year were the normal seasonal changes described by the seasonal indexes, then the total building permits in that 12-month interval would equal the seasonally adjusted annual rate for July. The seasonally adjusted annual rate has the advantage of facilitating comparisons with previous annual building permit figures as well as with the seasonally adjusted annual rates for prior months. The seasonally adjusted annual rate is neither a forecast nor a projection; rather it is a description of the rate at which building permits are issued in the particular month for which it is calculated.

The total number of new housing units authorized in 1997 was 1,441,136. Of these, 1,062,396 or 73.7 percent were for single housing units.<sup>25</sup> Table 2-15 shows the number of new privately owned housing units authorized by building permit, allocated to Census region and subregion.

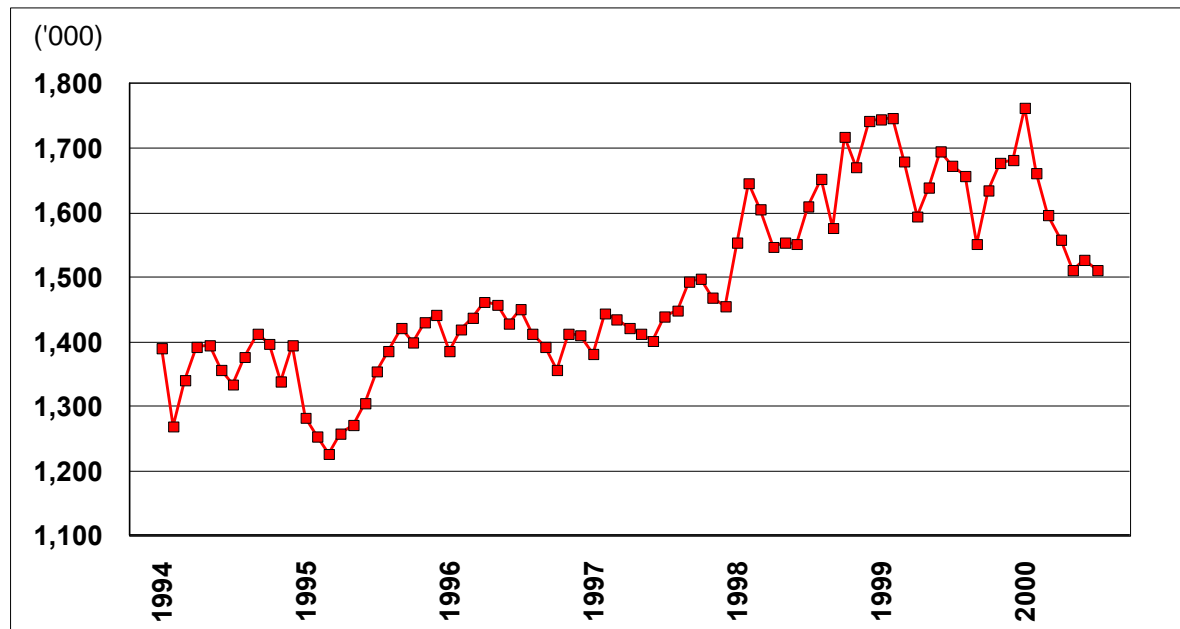


Figure 2-3. New Privately Owned Housing Units Authorized, Seasonally Adjusted Annual Rate, U.S.

Source: U.S. Census Bureau (2000e), Series C-40, Building Permits.

<sup>25</sup> A “housing unit” consists of a room or group of rooms intended for occupancy as separate living quarters by a family, by a group of unrelated persons living together, or by a person living alone. Separate living quarters are those in which the occupants live and eat separately from other persons in the building and have direct access from the outside of the building or through a common hall. In accordance with this definition, each apartment unit in an apartment building is counted as one housing unit.

**Table 2-15**  
**New Privately Owned Housing Units Authorized by Building Permits in Permit-Issuing Places in 1997, by Region**

Region	Sub-Region	Total	1 Unit	2 Units	3 and 4 Units	5 Units or More	Number of Structures with 5 Units or More
Northeast	New England	41,110	35,838	904	687	3,681	236
	Middle Atlantic	100,776	75,312	4,278	2,347	18,839	963
	<b>Total Region</b>	<b>141,886</b>	<b>111,150</b>	<b>5,182</b>	<b>3,034</b>	<b>22,520</b>	<b>1,199</b>
Midwest	East North Central	209,213	154,513	8,168	8,401	38,131	3,118
	West North Central	90,628	65,510	4,472	2,910	17,736	1,105
	<b>Total Region</b>	<b>299,841</b>	<b>220,023</b>	<b>12,640</b>	<b>11,311</b>	<b>55,867</b>	<b>4,223</b>
West	Mountain	179,632	134,403	2,548	3,675	39,006	3,098
	Pacific	183,913	132,670	4,590	5,180	41,473	2,902
	<b>Total Region</b>	<b>363,545</b>	<b>267,073</b>	<b>7,138</b>	<b>8,855</b>	<b>80,479</b>	<b>6,000</b>
South	South Atlantic	392,540	291,564	5,070	5,605	90,301	5,839
	East South Central	79,979	61,863	2,264	1,933	13,919	1,106
	West South Central	163,345	110,723	2,556	2,850	47,216	2,760
	<b>Total Region</b>	<b>635,864</b>	<b>464,150</b>	<b>9,890</b>	<b>10,388</b>	<b>151,436</b>	<b>9,705</b>
<b>TOTALS</b>		<b>1,441,136</b>	<b>1,062,396</b>	<b>34,850</b>	<b>33,588</b>	<b>310,302</b>	<b>21,127</b>

Source: U.S. Census Bureau (2000a).

### **Value of Projects**

The same Census program that compiles and reports data on the number of housing units authorized by building permit also compiles data on the value of permits issued. The value reported in the permits data refers to the value of structures and site improvements covered by the building permit, but excludes land costs.

The total value of residential building permits issued in the U.S. in 1997 was \$141.0 billion. Of this, \$121.2 billion, or 86.0 percent, was accounted for by single-family housing units.

Table 2-16 shows the value of new privately owned housing units authorized by building permits in 1997, by Census region and subregion. The South region accounted for \$55.9 billion (39.6 percent of the total), followed by the West with \$40.7 billion (28.8 percent), the Midwest with \$30.3 billion (21.4 percent), and the Northeast with \$14.1 billion (10.0 percent).

**Table 2-16**  
**New Privately Owned Housing Units Authorized- Valuation for Regions (Millions of 1997 Dollars)**

Region	Sub-Region	Total	1 Unit	2 Units	3 and 4 Units	5 Units or More
Northeast	New England	\$4,737.7	\$4,423.8	\$59.3	\$49.0	\$205.5
	Middle Atlantic	\$9,399.5	\$8,142.4	\$232.4	\$134.3	\$890.4
	<b>Total Region</b>	<b>\$14,137.2</b>	<b>\$12,566.2</b>	<b>\$291.7</b>	<b>\$183.3</b>	<b>\$1,095.9</b>
Midwest	East North Central	\$21,688.0	\$18,858.2	\$584.1	\$516.4	\$1,729.4
	West North Central	\$8,573.9	\$7,292.4	\$294.3	\$184.1	\$803.3
	<b>Total Region</b>	<b>\$30,261.9</b>	<b>\$26,150.5</b>	<b>\$878.3</b>	<b>\$700.4</b>	<b>\$2,532.6</b>
West	Mountain	\$17,426.3	\$15,038.7	\$225.4	\$245.8	\$1,916.4
	Pacific	\$23,299.2	\$19,693.7	\$389.6	\$410.3	\$2,805.6
	<b>Total Region</b>	<b>\$40,725.5</b>	<b>\$34,732.4</b>	<b>\$615.0</b>	<b>\$656.1</b>	<b>\$4,722.0</b>
South	South Atlantic	\$35,206.7	\$29,973.8	\$301.1	\$341.9	\$4,590.0
	East South Central	\$6,840.6	\$6,042.5	\$106.1	\$66.3	\$625.7
	West South Central	\$13,832.4	\$11,729.1	\$111.8	\$109.6	\$1,881.9
	<b>Total Region</b>	<b>\$55,879.7</b>	<b>\$47,745.4</b>	<b>\$518.9</b>	<b>\$517.8</b>	<b>\$7,097.6</b>
<b>TOTAL</b>		<b>\$141,004.4</b>	<b>\$121,194.5</b>	<b>\$2,304.0</b>	<b>\$2,057.7</b>	<b>\$15,448.2</b>

Figures rounded from thousands reported by Census.  
Source: U.S. Census Bureau (2000a).

#### **2.4.1.2 Nonresidential Building**

Census discontinued the collection of data on nonresidential construction authorized by building permits in 1995 due to budgetary restraints. To fill this data gap, EPA has used historical (pre-1995) data on nonresidential starts to establish a relationship between residential and nonresidential starts from which current nonresidential activity can be estimated.

### Number and Value of Projects

EPA analyzed data from 1980 through 1994 on the number of nonresidential building permits, number of residential building permits, the value of nonresidential buildings put in place, and a time trend to estimate a statistical relationship that could be used to predict the number of nonresidential permits issued in 1997.<sup>26</sup> Table 2-17 shows, for each region and subregion, the results from EPA's analysis. EPA used a linear regression of nonresidential building permits on the remaining three variables to estimate the number of permits.

The value of nonresidential building projects is reported by Census in the *Value Put in Place* data series. Table 2-17 also shows the value of nonresidential projects constructed in 1997 by region and subregion.

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<sup>26</sup> EPA assumes that there is a one-to-one correspondence between *permits* and *projects* for nonresidential construction activity. Therefore, the predicted number of nonresidential permits issued in 1997 is assumed to also be the predicted number of nonresidential projects for that year.

**Table 2-17**  
**Estimated Number of Nonresidential Building Permits for 1997, by Region**

<b>Region</b>	<b>Sub-Region</b>	<b>Nonresidential Permits (estimated)</b>	<b>Value Put in Place (millions of dollars)</b>
Northeast	New England	26,936	\$1,034
	Middle Atlantic	51,530	\$2,482
	<b>Total Region</b>	<b>78,466</b>	<b>\$3,516</b>
Midwest	East North Central	62,193	\$8,606
	West North Central	30,374	\$1,745
	<b>Total Region</b>	<b>92,568</b>	<b>\$10,351</b>
West	Mountain	27,696	\$2,187
	Pacific	51,408	\$6,736
	<b>Total Region</b>	<b>79,105</b>	<b>\$8,922</b>
South	South Atlantic	124,452	\$6,098
	East South Central	20,340	\$3,228
	West South Central	31,093	\$4,624
	<b>Total Region</b>	<b>175,886</b>	<b>\$13,950</b>
<b>TOTALS</b>	<b>United States</b>	<b>426,024</b>	<b>\$36,739</b>

Figures may not add to totals due to rounding.

Source: U.S. Census Bureau (2000a).

As shown in Table 2-17, the number of nonresidential building projects authorized by permits in 1997 is estimated at 426,024. The South had the highest number of nonresidential permits in 1997, with 175,886, or 41.3 percent of the total. The Northeast had the fewest nonresidential permits issued, with only 78,466, or 18.4 percent of the total.

The total value of nonresidential building projects constructed in 1997 was \$36.7 billion. As with nonresidential permits, the South had the highest value put in place, with \$13.9 billion (38.0 percent of total value put in place) while the Northeast had the lowest value of projects put in place with \$3.5 billion (9.6 percent of total).

### **2.4.1.3 Heavy Construction**

Heavy construction encompasses both building and nonbuilding construction activities, although 95 percent of the work performed by establishments in NAICS 234 (Heavy construction) is classified as nonbuilding construction. The largest component of heavy construction work is highway and street construction. These activities account for one-third of the value of construction work completed by the heavy construction industries. When highway and street construction is combined with bridge and tunnel construction, the total value of work climbs to \$53.3 billion, or 41.7 percent of the industry total. Heavy construction activities excluding roads, bridges, and tunnels (e.g., airport runways, sewers and water mains, transmission lines) account for the remaining 58.3 percent of construction value, but there is little data providing further detail on such activities. As a result, this section focuses principally on road, highway, bridge, and tunnel construction.

The Federal Highway Administration (FHWA) publishes the most detailed report on highway, bridge, and transit systems in the United States. The 1999 Report to Congress, *Status of the Nation's Highways, Bridges and Transit: Conditions and Performance* (C&P Report) includes not only information on the condition of these systems, but details on capital expenditures and improvements as well. The sections below summarize some of this data.

#### **Number of Projects**

Table 2-18 summarizes information from the C&P Report on the number of miles of highway, urban, and rural roads in the U.S., as well as the number of lane-miles represented. Highway lane-mileage has increased by an average of only 0.3 percent annually over the period 1987-1997. Although the report and Table 2-18 show the annual capital and maintenance expenditures on this roadway system, nowhere in the report (nor in any other data reviewed for this analysis) does FHWA present the *number of projects* funded or *number of miles* of new road completed. As a result, EPA lacks current estimates of the number of highway, road, bridge or transit construction projects that potentially would disturb land.



The number of rural highway *road-miles* (as distinguished from *lane-miles*) declined by an average of 0.2 percent annually between 1987 and 1997. During the same period, urban highway road-miles grew by an average of 1.7 percent annually. The decline of rural road mileage and comparative growth in urban road mileage may be due, at least in part, by the expansion of existing urban roadways indicated by the figures above for lane-mileage growth trends. Some areas that were previously classified as rural may also have been reclassified as urban during that 10-year period based on population growth.<sup>27</sup>

**Table 2-18. Highway Statistics**

<b>Statistic</b>	<b>1997 Data</b>	<b>1987-1997 Average Annual Growth (percent)<sup>a</sup></b>
Total Rural Highway Miles	3.11 million	-0.2
Total Urban Highway Miles	0.84 million	1.7
Total Highway Miles	3.95 million	--
Total Rural Highway Lane-Miles	6.37 million	--
Total Urban Highway Lane-Miles	1.89 million	2.1
Total Highway Lane-Miles	8.26 million	0.3
Total Highway Expenditures (All Govts.)	\$101.3 billion	--
Total Highway Capital Outlay (All Govts.)	\$48.7 billion	--
Total Highway Capital Outlay Per Lane-Mile	\$5,914	--
Total Highway Capital Outlay Per Road-Mile <sup>b</sup>	\$12,329-\$12,360	--

-- Not provided

<sup>a</sup> Not provided for all statistic categories.

<sup>b</sup> Range calculated by EPA as described in text.

Source: FHWA 1999, various tables.

<sup>27</sup> The C&P Report defines "rural" areas as areas with a population under 5,000. "Urban" areas are those with a population greater than or equal to 5,000.

## Value of Projects

The C&P Report presents highway and road expenditures by all levels of government ownership. Expenditures are further classified as capital and non-capital. Non-capital expenditures include maintenance and service outlays.<sup>28</sup> Maintenance activities are not expected to disturb significant amounts of land. Capital outlays refer to activities such as land acquisition and other right-of-way costs; preliminary and construction engineering; new construction, reconstruction, resurfacing, rehabilitation, and restoration of roadways, bridges, and other structures; and installation of guardrails, fencing, signs, and signals. Capital outlays are further classified according to whether they support system preservation, system expansion, or system enhancement. Definitions for these are as follows:

- **System Preservation**—capital improvements on existing roads and bridges; includes reconstruction, resurfacing, pavement restoration/rehabilitation, widening of narrow lanes and shoulders, bridge replacement and bridge rehabilitation; does not include routine maintenance costs (these costs are captured by “non-capital expenditures”).
- **System Expansion**—construction of new roads and bridges, as well as costs associated with adding lanes to existing roads; includes all of “New Construction,” “New Bridge,” “Major Widening,” and most costs associated with “Reconstruction - Added Capacity.”
- **System Enhancement**—includes safety enhancements, installation of intelligent transportation systems, and environmental enhancements.

Based on a review of these definitions, EPA concludes that the activities classified as capital outlays are most likely to result in land disturbances. In 1997, capital outlays totaled \$48.7 billion. Table 2-20 provides a more detailed breakdown of these expenditures.

Another 1999 FHWA report, *Our Nation's Highways*, shows that 6.9 percent of total state disbursements<sup>29</sup> for highways in 1998 went to new road and bridge construction. Another 36.3 percent went to other capital improvements on existing highways. Between 1995 and 1997, expenditures (from all jurisdictions) for system expansion grew at a faster rate than expenditures for either system

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<sup>28</sup> Maintenance outlays cover spot patching, crack sealing (roads and bridge decks), and maintenance/repair of route markers, signs, guardrails, fencing, signals, and lighting.

<sup>29</sup> Total state disbursements were \$80.5 billion in 1998. This figure includes Federal Aid for highways.

preservation or system enhancements. The C&P report shows that in 1997, 47.6 percent of capital outlays went toward system preservation; 8.0 percent went toward system enhancement; 15.6 percent went toward new roads and bridges; and another 28.8 percent went toward other system expansion.

The FHWA data does not report the mileage of new roads constructed versus the mileage lost (removed or taken out of commission due to condition). Some data is available for capital outlays by improvement type (such as new road construction, resurfacing, etc.). This information is presented in Table 2-19.<sup>30</sup>

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<sup>30</sup> The data in Table 2-19 is based on a sample of direct State expenditures on particular improvements. FHWA then used this state data to estimate a national average for roads under jurisdiction of all governmental units (local, state, federal) and for all roadway systems. The “Total, State Arterials & Connectors” is based on the direct State expenditures data; “Total, Arterials and Collectors, All Jurisdictions” is estimated based on the State data. FHWA reports that there is very little information on expenditures for *local functional class* roads. FHWA assumed that the expenditure patterns for local functional class roads more or less followed the expenditure patterns for arterials and collectors and used this assumption to estimate the total capital outlay by all government units for all road systems (arterials, collectors, and local functional class roads). These expenditures are accounts of *governmental unit spending*, not of construction contractor spending, though it may be assumed that since the majority of roads are owned by some government unit (local, state, federal), any costs incurred by the construction contractor would ultimately be paid for with government funds.

**Table 2-19. Highway Capital Outlay by Improvement Type, 1997 (Billions of Dollars)**

Expenditure Item	System Preservation	System Expansion		System Enhancement	Total
		New Roads & Bridges	Existing Roads		
<b>Direct State Expenditures on Arterials and Collectors</b>					
Right-of-Way		0.9	1.5		2.4
Engineering	2.6	0.8	1.3	0.4	5.1
New Construction		3.1			3.1
Relocation			1.7		1.7
Reconstruction-Added Capacity	1.1		2.6		3.7
Reconstruction-No Added Capacity	1.0				1.0
Major Widening			1.8		1.8
Minor Widening	0.8				0.8
Restoration & Rehabilitation	2.5				2.5
Resurfacing	3.4				3.4
New Bridge		0.6			0.6
Bridge Replacement	1.7				1.7
Major Bridge Rehabilitation	1.5				1.5
Minor Bridge Work	0.7				0.7
Safety				1.2	1.2
Traffic Management/Engineering				0.4	0.4
Environmental and Other				0.5	0.5
<b>Total, State Arterials &amp; Collectors</b>	<b>15.2</b>	<b>5.4</b>	<b>8.9</b>	<b>2.5</b>	<b>32.1</b>
<b>Total Expenditures on Arterials and Collectors, All Jurisdictions (estimated)<sup>a</sup></b>					
Highways and Other	13.7	5.3	11.2	3.1	33.2
Bridge	4.9	0.8			5.6
<b>Total, Arterials and Collectors</b>	<b>18.5</b>	<b>6.0</b>	<b>11.2</b>	<b>3.1</b>	<b>38.9</b>
<b>Total Capital Outlay on All Systems (estimated)<sup>b</sup></b>					
Highways and Other	17.1	6.6	14.0	3.9	41.7
Bridges	6.1	1.0			7.0
<b>Total Capital Outlay, All Systems</b>	<b>23.2</b>	<b>7.6</b>	<b>14.0</b>	<b>3.9</b>	<b>48.7</b>
<b>Percent of Total Expenditures</b>	<b>47.6%</b>	<b>15.6%</b>	<b>28.8%</b>	<b>8.0%</b>	<b>100.0%</b>

<sup>a</sup> Improvement type distribution was estimated based on State Arterial and Collector data.

<sup>b</sup> Includes expenditures for arterials and collectors as well as for local functional class roads.

Sources: Highway Statistics 1997, Table SF12-A and unpublished FHWA data; all FHWA 1999 Exhibit 6-13

#### **2.4.1.4 Characterization of Supply**

This section discusses the characteristics of supply in the C&D industry such as market structure, barriers to entry, and supply trends.

##### **Market Structure**

Section 2.3 summarized information about the size distribution of developers and builders, based on employee and revenue size criteria. As shown there, the industry consists predominantly of small firms and sole proprietorships who generally operate on a localized basis within a specific geographic market. Anecdotal information indicates that a large number of small firms focus on niche markets that are not as easily accessible to the large-scale builders (Housing Zone, 2001).

While the majority of firms are small, a small number of large operators do control a sizeable share of the market. In its special report on homebuilding, for example, Census reports that just over 100 builders, representing only 0.3 percent of all establishments, accounted for 90,772 new single-family homes, or 18.4 percent of the total. This represented an average of 865 homes per builder (see Table 2-20).<sup>31</sup> Assuming an average sales price of \$200,000, builders in this size class would have average revenues of \$173 million, substantially above the overall industry average of \$1.0 million. At the top of the industry are builders like Pulte Corporation (\$3.8 billion in housing revenues), Kaufman and Broad (\$3.7 billion), and Centex Corporation (\$3.3 billion) who operate nationwide and wield considerable market power.<sup>32</sup>

Discussions with representatives of the homebuilding industry suggest there are at least two common business models in the industry. Most projects are managed by either a single land developer who sells improved lots to individual builders, or feature a developer-builder who both develops the land and builds on it (some developers may sell some lots and retain others to build on themselves). Figure 2-4 illustrates these two alternatives.

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<sup>31</sup> These data are based on a subset of builders that are 100 percent specialized in new single-family home construction.

<sup>32</sup> <http://www.housingzone.com/topics/pb/build/giants2000/2000400.asp> accessed 3/9/01.

**Table 2-20**  
**Selected Statistics for Establishments by Single-Family Housing Starts Size Class: 1997**  
 [Detail may not add to total because of rounding]

Number of Housing Starts	Establishments		Starts		Starts per Establishment
	No.	% of Total	No.	% of Total	
0	3,736	11.0%	0	0.0%	0.0
1-4	14,781	43.6%	33,363	6.8%	2.3
5-9	6,557	19.3%	42,175	8.6%	6.4
10-24	5,411	16.0%	79,226	16.1%	14.6
25-99	2,608	7.7%	109,258	22.2%	41.9
100-499	720	2.1%	138,000	28.0%	191.7
500+	105	0.3%	90,772	18.4%	864.5
Total	33,918	100.0%	492,792	100.0%	14.5

Source: U.S. Bureau of the Census, Construction Sector Special Study Table 3a.  
<http://www.census.gov/ftp/pub/const/www/starts.pdf>

### Barriers to Entry

In the economics literature, barriers to entry are considered to exist when it is difficult for a new firm to enter an existing market. According to academics who have studied the homebuilding industry, there are two types of barriers to entry for new homebuilding firms—entry costs and input cost differentials (Landis, 1986).

- *Entry cost differentials* are the additional costs a new homebuilder must incur to participate in a given market. These costs may be manifested in the form of local development fees, abnormally high land costs, or abnormally high wages. In the short run, entry cost barriers raise the cost of building and keep builders who are unable or unwilling to pay the extra costs out of the market. In the long run, builders produce at less than their optimal scale (i.e., to the left of the lowest point on their marginal cost curve) to avoid holding unsold inventory in a downturn. Thus, entry barriers flatten the industry average cost curve by increasing builders' exposure to "cyclical risk." In addition, these barriers tend to reduce the advantage of high volume builders over the long term (Landis, 1986).

- *Input cost differentials* are exhibited when new homebuilders must pay higher prices for inputs than existing firms, or when they are prevented from accessing necessary inputs. Usually, input price differentials are a temporary phenomenon but some forms of regulation can create permanent price differentials.

The existence of entry costs also increases the importance of up-front financing for home building projects. The builder must invest more funds earlier in the project to overcome the entry barrier. Firms with established credit may be able to borrow some of this up-front financing, while less well-established firms must use their own capital. In either case, the opportunity costs of the investment are larger so regulatory delays and environmental compliance requirements become more burdensome (Landis, 1986). Much of the cost of building regulation is the interest that accrues on invested funds while permits and variances are negotiated. Luger and Temkin (2000) estimate that the costs of delay for a 25-unit subdivision rise from \$3,692 per month in the approvals stage to \$13,400 per month in the construction phase.

Similar issues confront non-residential and heavy construction contractors. Non-residential projects are generally larger than residential projects, so builder financing and carrying costs are proportionately larger. Since fewer firms can take on large projects, the opportunity for incumbent firms to maintain barriers to entry is also greater. Most heavy construction is carried out under government or utility contracts where competitive bidding is required. This may tend to level the playing field for entering firms who can overcome the basic qualification requirements.

#### ***2.4.1.5 Supply Trends***

This section provides a brief overview of trends in homebuilding practices that could potentially influence baseline ESC practices or the adoption of ESC options proposed by EPA under the effluent guidelines.

The National Governors Association (NGA) recently published a report examining a concept they have termed New Community Design (NCD). According to the report, NCD encompasses many of the concepts popular in residential design today: New Urbanism, Traditional Neighborhood Development, compact development, livable communities, master-planned communities, and neo-

traditional design. NCD has been described as “neighborhoods of housing, parks, and schools within walking distance of shops, civic services, jobs, and transit—a modern version of the traditional town” (Peter Calthorpe, as quoted in Hirschhorn and Souza, 2001, p. 9). This and other types of design such as low impact development (LID) have garnered new-found attention in recent years, and continue to be key topics for development professionals. Both NCD and LID are discussed in more detail below.

### **New Community Design**

NCD is a development design philosophy aiming to create a walkable, multi-purpose community structure that decreases dependency on automobiles, takes advantage of public transportation, incorporates parks and other green spaces, and uses existing infrastructure. A community based on NCD incorporates residential, commercial, and institutional facilities. Residential communities are a blend of single and multi-family housing, and often blend commercial and retail facilities with housing units as well. According to the NGA report, approximately *one-third* of potential homebuyers would prefer an NCD community versus a traditional, sprawl-based development—provided that the option existed. Currently *less than one percent* of total housing construction is based on NCD principles. This means that the option to live in a NCD community versus a traditional sprawl community does not exist for many potential homebuyers. NGA identifies the following factors as limiting the adoption of NCD and similar concepts:

- Local zoning codes make it difficult for mixed-use communities to get approved.
- Lenders favor single-use residential projects, strip malls, and suburban office parks. This favoritism “causes conventional real estate analyses to discount the long-term returns of NCDs, making them difficult to finance” (Hirschhorn and Souza, p. 13).
- Conventional developers and builders have expertise in single-use projects and, as a result, continue doing what they are already familiar with. In many cases these individuals are not able, or prepared, to deal with the increase in up-front costs arising from the increased intensity at the planning and design stage of a NCD project.

A survey by the Canada Mortgage and Housing Corporation compared the costs and benefits of a conventional development (4,505 dwellings) with an NCD alternative (6,875 dwellings). The incremental savings resulting from the NCD alternative, on a per housing unit basis, were as follows: roads, \$3,054; storm water management, \$1,499; transit, \$1,330; water, \$1,099; policing, \$1,016; and



sanitary services, \$975. The total infrastructure savings for the NCD alternative are \$61.5 million (Hirschhorn and Souza, p. 36). The NGA report offers one solution to the lagging supply of NCD construction: implement parallel building codes. Such parallel building codes may serve to “level the playing field” with conventional subdivision development while still allowing conventional development to take place.

### **Low-Impact Development**

LID is a development design strategy that aims to protect the natural pre-development hydrological function of a site. True LID shares many features with NCD, such as smaller lot sizes and the addition of greenspace to the site plan. However, whereas NCD focuses on mixed-use development, LID at this time focuses primarily on residential development, although LID concepts may be easily applied to other types of development (e.g., commercial, mixed-use).

The primary goals of LID are to: (1) minimize development impacts by reducing impervious surfaces, maintaining natural site drainage, reducing curb and gutter construction, and reducing clearing and grading; (2) create dispersed runoff controls on individual lots utilizing swales, flatter slopes, rain gardens, etc.; (3) maintain pre-development hydrology; and (4) encourage pollution prevention and runoff management by individual property owners (Coffman et al., 1998).

Conventional site design relies on storm water controls that collect and convey runoff away from the property as quickly as possible. This type of design relies on pipes, paved surfaces, drainage ditches, and gutters as well as traditional best management practices (BMPs) such as ponds and sediment basins. Such conventional design actually amplifies hydrologic changes (increased volume, runoff frequency, and discharge rate) as “natural storage is lost, the amount of impervious surfaces is increased, the time of concentration is decreased, runoff travel times are decreased and the degree of hydraulic connection is increased” (Prince George’s County, 1999). In addition, while many conventional storm water control techniques are designed to “maintain the peak runoff discharge rate at predevelopment levels for a particular design storm event,” only the runoff *rate* is controlled, leaving the runoff volume, frequency, and duration to increase unchecked (Coffman et al., 1998).

As with any relatively new technology or approach,<sup>33</sup> there are many concerns surrounding the effectiveness, costs, and benefits of LID as compared with conventional site design. Developers and builders want to know how using LID techniques will affect financing and their bottom line, while consumers want to know how it will affect their ability to purchase a new house, as well as their resale value.

Many in the construction industry have found that they face *lower* development costs with LID than with conventional “curb and gutter” design. A presentation at a 1999 Storm Water Workshop for the Florida Keys Carrying Capacity Study (FKCC; sponsored by the U.S. Army Corps of Engineers, Jacksonville Division) demonstrates how LID can lower overall development costs. Table 2-21 reproduces the construction cost table presented for a residential development in Maryland.

**Table 2-21. Construction Cost Comparison for Low Impact Development**

Cost Element	Conventional Development	Low Impact Development
Grading/Roads	\$569,698	\$426,575
Storm Drains	\$225,721	\$132,558
SWM Pond/Fees	\$260,858	\$10,530
Bioretention/Micro	--	\$252,124
Total	\$1,086,277	\$821,787
Unit Cost	\$14,679	\$10,146
Lot Yield	74	81

Source: Coffman, 1999

As shown above, construction costs associated with development were estimated to be nearly \$250,000 lower for a LID development plan than for a conventional plan. In addition, the LID design actually increased lot yield from 74 lots to 81 lots. This is only one example of reduced construction costs and/or increased lot yield achievable through LID design.

<sup>33</sup> The term “relatively new” is used quite loosely here. LID technologies have been in use for some time, although such designs are just now beginning to gain mainstream acceptance.

The major additional cost developers incur when choosing LID (as well as NCD), is the increased time and effort often needed at the design stage of a project. The additional planning time is used to assess site hydrology, design runoff controls for each lot, and other considerations. Conservation-oriented design “creates significant upfront costs and raises questions of financial viability” (Mammoser, 2000, p. 45). These costs can increase more if structures are built using environmentally-friendly materials, which have generally higher “first cost” compared to more traditional materials. As noted by Mammoser, (2000), potential lenders may be wary of financing a LID project. As more LID projects prove successful and profitable, however, lenders may become more accepting of such “alternative” forms of development and perceive them as no more risky—and perhaps less risky—than conventional developments.

#### **2.4.2 Characteristics of Construction Demand**

This section describes the factors and characteristics of demand in the C&D industry. The major demand factors addressed are: housing demand and demand elasticity, the impact of regulation on demand for housing, and demand for nonresidential and heavy construction.

##### ***2.4.2.1 Demand Factors Affecting Construction and Development Activities***

According to a recent study (Luger and Temkin, 2000), market demand is one of the three major factors taken into consideration by a builder/developer when deciding whether or not to propose a development. Market demand includes the types and quantities of housing units the public wants, and is affected by general macroeconomic conditions, demographics, and consumer tastes. Other factors that may affect demand for C&D activities include inflation (Henderschott, 1980), transaction costs (i.e., costs associated with purchasing a new home/facility) (Haurin and Chung, 1998), expected length of tenure (Haurin and Lee, 1989), mortgage loan to house value (Haurin and Lee, 1989), and borrowing constraints (Linneman et al., 1997; Zorn, 1993). Changing demographics tend to have a fairly large effect on the *type* of residential housing demanded (i.e., single-family versus multifamily) (Hirsch, 1994; Eppli and Childs, 1995).

#### **2.4.2.2 Housing Demand and Elasticity**

As discussed above, housing demand is largely determined by macroeconomic factors, demographics, and consumer tastes. Changes in the age of family formation, the size of families, and their perceived needs for space will affect the market's demand for houses of various sizes and styles. Geographic shifts in economic activity and changes in worker mobility affect where people wish to live. As these market factors evolve, an increasing number of buyers find that existing housing does not meet their desires. In other words it becomes an imperfect substitute for new housing (Landis, 1986). As an illustration, the average size of new homes has been increasing in the U.S., even as family sizes have diminished or remained unchanged. In 1995, the average size of a new home was 2,095 square feet. By 1999 the average had risen more than 6 percent, to 2,225 square feet (Census, 2000c). Existing housing does, however, act as a check on the prices of new housing (Landis, 1986) since it serves as the default alternative.

Demand for new construction may be viewed as the outcome of a four-way household decision process in which households decide whether to buy an existing home, buy a newly constructed home, improve their current home, or do nothing. In light of demographically-driven demand and the existence of near substitutes, it is not surprising that empirical studies find a somewhat inelastic demand for new housing (DiPasquale, 1999). Price is not the strong determining factor in housing markets that it is in more commodity-like markets. Luger and Temkin (2000) report that this inelasticity is more pronounced in the higher-end housing markets.

Demographic trends are local as well as national phenomena. Different parts of the country grow at different rates and as the size and make up of the local population changes so do housing tastes and preferences. Location is a key aspect of housing demand, perhaps more significant than price. As a result, demand for homes in favorable locations is far stronger than demand for homes in less desirable locations. Strong demand in certain regions or neighborhoods will be reflected in a less elastic demand curve.

### 2.4.2.3 Impact of Regulation on Housing Demand

Increased regulations may exert upward pressure on housing prices which may, in turn, price some potential homebuyers out of the market due to income constraints. Luger and Temkin (2000) give the following example: if regulations on the construction industry increase the price of a house by \$10,000, a household would need \$2,500 more in annual income to still qualify for the house. The authors define “excessive” regulation as those regulations that are “beyond what is essential” to accomplish set environmental or developmental goals, or those delays that are longer than what should be necessary to accomplish a fair review of plans (Luger and Temkin, 2000). Table 2-22 illustrates this effect.

**Table 2-22. Impact of Regulatory-Driven Delays on Housing Affordability**

Parameters	No Delay/No Excessive Regulation	With Delays and Excessive Regulation
House Price	\$175,000	\$185,000 <sup>b</sup>
PITI Payment <sup>a</sup> (per month)	\$1,377	\$1,437 <sup>c</sup>
Income Needed to Qualify for Mortgage	\$55,000	\$57,500

<sup>a</sup> Principal, Interest, Tax, Insurance Payment. Assumes an 80 percent, 30-year conventional mortgage at 8 percent interest, using tax and insurance data from New Jersey.

<sup>b</sup> Assumes \$10,000 in regulatory costs added to the home price.

<sup>c</sup> Calculated using typical mortgage spending limit equal to 30 percent of gross income.

Source: Luger and Temkin 2000, pages 10-11.

Housing demand, especially in the higher-end market, tends to be fairly inelastic. This inelasticity results in the appearance of a multiplier effect with regard to regulatory costs and sales price. In other words, a one dollar increase in costs to the builder will translate into a more than one dollar cost to the consumer (if costs are passed forward as they tend to be with inelastic markets). Estimates for the magnitude of this multiplier range from two to six, with the average being approximately four (Luger and Temkin, 2000). The potential impact of this proposed rule on housing prices is discussed and analyzed in Chapters Four and Five.

### 2.4.2.4 Trends in New Homes Sold

Table 2-23 shows the number of new one-family houses sold and for sale from 1981 through 1999, including the median number of months from start to sale, average sales prices, and median sales price.

**Table 2-23**  
**New One-Family Houses Sold and For Sale**

Year	Total (Thousands)	Median Months Start to Sale	Average Sales Price	Median Sales Price
1981	436	5.1	\$83,000	\$68,900
1982	412	3.9	\$83,900	\$69,300
1983	623	2.9	\$89,800	\$75,300
1984	639	3.4	\$97,600	\$79,900
1985	688	3.9	\$100,800	\$84,300
1986	750	3.6	\$111,900	\$92,000
1987	671	3.9	\$127,200	\$104,500
1988	676	4.0	\$138,300	\$112,500
1989	650	4.3	\$148,800	\$120,000
1990	534	4.5	\$149,800	\$122,900
1991	509	4.4	\$147,200	\$120,000
1992	610	3.5	\$144,100	\$121,500
1993	666	3.6	\$147,700	\$126,500
1994	670	3.8	\$154,500	\$130,000
1995	667	4.3	\$158,700	\$133,900
1996	757	4.2	\$166,400	\$140,000
1997	804	3.7	\$176,200	\$146,000
1998	886	3.5	\$181,900	\$152,500
1999	907	3.3	\$195,800	\$160,000

Source: Bureau of the Census (2000c).

#### **2.4.2.5 Nonresidential Demand Characteristics**

Demand characteristics affecting the nonresidential and heavy construction sectors are similar to those affecting the residential sector. General economic conditions, interest rates, and past industry activity all have an effect on current demand. According to a recent press release by CMD (2001b), the demand and supply cycles in construction are highly localized, and at any given time different cities across the nation are at different points in their own cycles. For example, as of October, 2001, office markets in Washington D.C., San Diego, Los Angeles, and several areas in New York were experiencing increasing office vacancies, but new construction was still occurring. In markets such as Dallas, Jacksonville, Tampa, and Salt Lake City, however, there has been low or even negative demand growth. While buildings in progress are still being completed, new construction starts have slowed dramatically. The industrial market was still fairly stable in October and had not yet begun showing signs of substantial decline (CMD, 2001b).

As with residential construction, general population growth should ensure that demand for all building types will continue to rise in the future (CMD, 2001b). The rate at which demand increases, however, is certainly variable and may not be the same for all markets in all portions of the United States. For the commercial building market in particular, past building activity has affected demand through recent years. The Economic Recovery Tax Act of 1981 fueled a commercial building boom that ultimately generated severe excess capacity in the market (CMD, 2001a). This caused a decrease in demand for new commercial construction throughout the late 1980s and into the 1990s as the market worked to absorb some of the excess commercial space. The growth in the technology sector in the late 1990s spurred another boom in the office market. According to CMD (2001a), approximately 20 million square feet of office space was built between 1998 and 2000 as a result of increased demand from this one sector. Vacancy rates increased once again as the year 2000 brought the decline of the technology sector and associated economic downturn.

For the commercial and industrial sectors, increasing vacancy rates tend to be followed by a decrease in new construction activity as the market tries to absorb the over-supply of space. The demand for new construction in these sectors is heavily influenced by the performance of other sectors, as evidenced by the technology sector example above. A “boom” in one industry necessitates the

acquisition of new space for expansion; if the market does not have a ready supply of the type of space needed, then new construction increases. At the same time, a “bust” in a given industry will free up space in the market, and until the space is absorbed, new construction will slow. As with residential construction, lower interest rates may increase construction activity, while higher rates will tend to slow activity.

#### ***2.4.2.6 Heavy Construction Demand Characteristics***

The heavy construction industry (NAICS 234) is defined by the U.S. Census Bureau to include those establishments that are “engaged in the construction of heavy engineering and industrial projects (except buildings) such as highways, power plants, and pipelines” (U.S. Census Bureau, 2000f). Heavy construction projects are characterized by their linear nature, as many projects are spread along a horizontal, rather than vertical, plane (Ringwald, 1993). Since the definition of heavy construction projects excludes buildings, these projects are much more weather-sensitive than building construction and there are fewer days suited for heavy construction projects nationwide, especially in the northern states (Ringwald, 1993). The general trend in heavy construction through the 1990s was toward the rehabilitation of existing infrastructure (Ringwald, 1993).

In addition, the majority of heavy construction projects (and the majority of the value of construction work) is performed for public, rather than private, owners (Ringwald, 1993; U.S. Census Bureau, 2000f, p.5). As Table 2-24 shows, more than 50 percent of the value of construction work in NAICS 234 occurs under government-owned projects, compared with less than 25 percent of the value in NAICS 233 (Building, developing, and general contracting) and NAICS 235 (Special trades). This division of project ownership sets the heavy construction sector apart from the other major construction sectors.

For heavy construction firms, work done for a public entity generally entails different contractual requirements than work done for private entities. When the project owner is a public entity such as a city, state, or federal government, at least 50 percent of the contract-related jobs are generally performed by the prime contractor, or conversely, less than half of the work under a given contract will be



subcontracted to other firms (Ringwald, 1993). This practice provides a public owner with more easily enforceable specifications, since the majority of the work is done by the primary contractor (Ringwald, 1993). On the other hand, 80 to 100 percent of the work on a privately-owned project may be subcontracted to firms other than the prime contractor (Ringwald, 1993).

The negotiated contracts often used in private-sector construction are not as common in the public arena. This is because a private owner generally has to prove the cost-effectiveness of the contract only to the owner's satisfaction, whereas a public owner may be called on to demonstrate the cost-effectiveness of such contracts to large numbers of taxpayers (Ringwald, 1993). For this reason, most heavy construction contracts let by public entities are competitively bid. Often, local law or agency regulations require the use of competitive bidding for public projects. There is a sense that such a system provides fairness in the awarding of contracts, as well as providing value to the taxpayers (ASCE, 2000).

**Table 2-24. Value of Construction Work by Project Ownership (1997, \$thousands)**

1997 NAICS code	Description	Owned by Federal Government	Owned by State/Local Govts.	Total Govt. Owned	Govt. Owned as Percent of Total	Privately Owned	Privately Owned as Percent of Total	Total Private and Government
233	Building, developing, and general contracting	\$14,362,134	\$43,472,528	\$57,834,664	15.2%	\$323,806,944	84.8%	\$381,641,608
234	Heavy Construction	\$8,845,515	\$60,368,420	\$69,213,936	54.1%	\$58,627,664	45.9%	\$127,841,600
235	Special Trade Contractors <sup>a</sup>	\$559,910	\$2,179,346	\$2,739,258	17.2%	\$13,171,513	82.8%	\$15,910,771
<b>TOTAL</b>		<b>\$23,767,559</b>	<b>\$106,020,294</b>	<b>\$129,787,858</b>	<b>24.7%</b>	<b>\$395,606,121</b>	<b>75.3%</b>	<b>\$525,393,979</b>

<sup>a</sup>Covers establishments in NAICSs 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Source: U.S. Census Bureau (2000f), *1997 Census of Construction*.

Figures may not add to totals due to rounding.

## 2.5 ECONOMIC AND FINANCIAL CHARACTERISTICS

### 2.5.1 Value of Work Done

For the C&D industries, the Bureau of Census defines the *value of construction work* as the combined value of completed work on new construction, additions, alterations, reconstruction, and maintenance and repair. In addition, the Census defines the *value of business done* as the sum of the value of construction work plus other business receipts, which include: receipts from retail and wholesale trade, rental of equipment, manufacturing, transportation, legal service, insurance, finance, rental of property and other real estate operations, and other non-construction activities. While the value of construction work is a good indicator of economic performance specifically related to C&D activity, the value of business done measure provides a better *overall* indicator of the economic performance of establishments in the C&D industries.

In addition to value of construction work, value of other receipts, and value of work done, the 1997 Census of Construction Industries includes three other measures: value of construction work subcontracted in from others, net value of construction work, and value added. The value of construction work subcontracted in from others includes the value of construction work done by reporting establishments as subcontractors. The net value of construction work is calculated by subtracting the costs of construction work subcontracted out to others from the value of construction work done. The value added component is equal to the value of business done minus the costs of construction work subcontracted to others and the costs for materials, components, supplies, and fuels (see Section 2.5.2 for discussion of these costs).

Table 2-25 below shows, for each of the C&D industries, the dollar value of business done (or total revenues), value of construction work, value of other business receipts, value of construction work subcontracted in from others, net value of construction work, and value added. Overall, the total *value of business done* (or revenues) in the C&D industries was \$534.2 billion in 1997. This represented a nominal increase of 57.8 percent over the \$338.5 billion in business done in 1992. NAICS 233 (Building and Developing, including NAICS 2331) accounted for \$386.9 billion or 72.4 percent of the total in 1997. The value of business done by heavy construction contractors (NAICS 234) was \$130.8 billion

(24.4 percent of the total), while special trade contractors (NAICS 23593 and 23594) earned \$16.5 billion (3.1 percent of the total).

The total *value of construction work* done in the C&D industries was \$525.4 billion and represented 98.3 percent of total business done in 1997. This represented a nominal increase of 58.9 percent over the \$330.6 billion in construction work done in 1992. Again, NAICS 233 (Building, developing, and general contracting, including NAICS 2331) accounted for the largest share, completing \$381.6 billion (or 74.7 percent) of the total value of construction work done in the C&D industries in 1997. Construction work by heavy construction contractors (NAICS 234) was valued at \$127.8 billion (24.3 percent of the total). Work done by excavation and wrecking/demolition contractors (NAICS 23593 and 23594) was worth \$15.9 billion and represented 3.0 percent of the total value of construction work done in 1997.

In addition to the \$525.4 billion in construction work done, the C&D industries also *subcontracted in* \$43.0 billion in construction work from others. This represented a nominal increase of 91.2 percent over the \$28.2 billion in work subcontracted in during 1992. Although NAICS 233 accounted for the highest share of construction work value, NAICS 234 (Heavy construction) earned the greatest share of work subcontracted in, totaling \$28.4 billion or 52.6 percent of the total construction work subcontracted in by the C&D industries in 1997.

As explained above, the *net value of construction work* is calculated by subtracting the value of work subcontracted out to others from the value of construction work done. For the C&D industries, this measure totaled \$318.6 billion in 1997, a nominal increase of close to 60 percent over the 1992 figure of \$199.3 billion. Costs for materials, components, supplies, and fuels can be further subtracted to obtain the *value added* measure, which amounted to \$199.9 billion in 1997, a nominal increase of 70.3 percent over 1992. Of the 1997 total, NAICS 233 (including NAICS 2331) accounted for \$120.3 billion, or 60.2 percent. Establishments in NAICS 234 (Heavy construction) accounted for \$68.8 billion, or 34.4 percent of the value added while NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) accounted for \$10.8 billion, representing 5.4 percent of the total.

Table 2-26 shows the value of construction work done by major type of construction (building construction, nonbuilding construction, and construction not specified by kind) for each of the large NAICS categories (Building, developing, and general contracting; Heavy construction, and Special trades). The largest type of activity for both building contractors and special trades was single-family house construction. Highways and street-related construction were the largest category of activity for heavy construction contractors, followed by sewer and water main construction. Table 2A-3 in Appendix 2A contains a more detailed table, showing value of construction work done by specific type of construction.

**Table 2-25**  
**Value and Net Value of Construction Work (Thousands of 1997 Dollars)**

NAICS	Description	Dollar Value of Business Done <sup>a</sup> (\$1,000)	Value of const work <sup>b</sup> (\$1,000)	Value of other business receipts <sup>c</sup> (\$1000)	Construction work subcontracted in <sup>d</sup> (\$1,000)	Net value of construction work <sup>e</sup> (\$1000)	Value added <sup>f</sup> (\$1,000)
233, except 2331	Building, developing, and general contracting, except land development and subdivision	\$372,516,170	\$368,006,098	\$15,451,969	\$4,510,092	\$188,579,070	\$111,168,087
2331	Land subdivision and land development	\$14,409,755	\$13,635,521	\$774,235	\$272,860	\$10,247,820	\$9,154,633
234	Heavy construction	\$130,794,520	\$127,841,600	\$2,952,920	\$28,386,274	\$105,639,352	\$68,775,976
235 <sup>g</sup>	Special trade contractors	\$16,497,584	\$15,910,770	\$586,814	\$9,845,092	\$14,130,038	\$10,818,550
<b>TOTAL</b>		<b>\$534,218,029</b>	<b>\$525,393,989</b>	<b>\$19,765,938</b>	<b>\$43,014,318</b>	<b>\$318,596,280</b>	<b>\$199,917,246</b>

<sup>a</sup> Dollar value of business done comprises the total value of construction work and other business receipts from 1997.

<sup>b</sup> Value of construction work includes all value of construction work done during 1997 for construction work performed by general contractors and special trade contractors. Included is new construction, additions and alterations or reconstruction, and maintenance and repair construction work. Also included is the value of any construction work done by reporting establishments for themselves.

<sup>c</sup> Other business receipts include receipts from retail and wholesale trade, rental of equipment, manufacturing, transportation, legal service, insurance, finance, rental of property and other real estate operations, and other non-construction activities.

<sup>d</sup> Value of construction work subcontracted in from others includes the value of construction work during 1997 for work done by reporting establishments as subcontractors

<sup>e</sup> Net value of construction work is derived for each establishment by subtracting the costs for construction work subcontracted to others from the value of construction work done.

<sup>f</sup> Value added, derived for each establishment, is equal to dollar value of business done less the costs of construction work subcontracted to others and costs for materials, components, supplies, and fuels.

<sup>g</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Source: U.S. Census Bureau (2000a).

**Table 2-26**  
**Value of Construction Work by Type of Construction (Thousands of 1997 Dollars)**

Type of Construction	Building, developing, and general contracting		Heavy construction		Special trade contractors <sup>a</sup>		Total	
	<i>Value</i>	<i>Pct.</i>	<i>Value</i>	<i>Pct.</i>	<i>Value</i>	<i>Pct.</i>	<i>Value</i>	<i>Pct.</i>
Building construction, total	\$371,426,049	97.32%	\$5,218,782	4.08%	\$12,550,515	78.88%	\$389,195,346	74.08%
Nonbuilding construction, total	\$5,970,952	1.56%	\$121,763,483	95.25%	\$3,036,318	19.08%	\$130,770,753	24.89%
Construction work, n.s.k.	\$4,244,630	1.11%	\$859,210	0.67%	\$323,939	2.04%	\$5,427,779	1.03%
<b>Total value of construction work</b>	<b>\$381,641,600</b>	<b>100.00%</b>	<b>\$127,841,600</b>	<b>100.00%</b>	<b>\$15,910,770</b>	<b>100.00%</b>	<b>\$525,393,970</b>	<b>100.00%</b>

NA = Data Not Available

<sup>a</sup>Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Source: U.S. Census Bureau (2000a).

## **2.5.2 Selected Costs**

The Census of Construction reports on the categories of costs incurred by the C&D industries, including costs of materials, components, and supplies; costs of construction work subcontracted out to others; costs of power, fuels, and lubricants; costs of machinery, equipment, and buildings; and other selected purchased services. Costs of materials, components, and supplies reflect the costs of purchasing all materials, components, and supplies, except fuels, but do not include industrial and specialized machinery and equipment costs such as printing presses and computer systems nor costs of materials furnished to contractors by the owners of projects. Costs of construction work subcontracted out to others do not include the costs of purchasing materials, components, and supplies provided to a subcontractor for use nor costs for machinery or equipment rental. Included in the costs of power, fuels, and lubricants are the costs of fuels, lubricants, and electric energy purchased from other companies or received from other establishments of the company, plus costs for natural and manufactured gas, fuel oil, coal, and coke products. The selected materials costs described above are presented in Table 2-27.

### **2.5.2.1 All Costs**

As shown in Table 2-27, all C&D establishments incurred costs of \$334.3 billion in 1997 for materials, components, work subcontracted out, power, fuels, and lubricants. This represented a nominal increase of 59.6 percent over the \$209.5 billion in costs incurred in 1992. Establishments in NAICS 233 (Building and developing, including NAICS 2331) accounted for \$266.6 billion, or 79.7 percent of the total. Establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) incurred costs of \$5.7 billion, or 1.7 percent of the total.

### **2.5.2.2 Machinery and Equipment Costs**

Machinery and equipment costs include the costs to rent or lease construction machinery and equipment; transportation equipment; production equipment; office equipment, furniture and fixtures; and scaffolding; and the costs of renting or leasing office space and buildings, which define the costs of



buildings. The Census Bureau also reports costs of selected purchased services, including communication services purchased from other companies or from other establishments of the company, and the costs of all repairs made to structures and equipment by outside companies or from other establishments of the same company. These machinery, equipment costs, and selected services costs are presented in Table 2-28.

According to Table 2-28, establishments in the C&D industries spent \$7.3 billion on machinery, equipment, and buildings in 1997. This represented a nominal increase of 43.1 percent from 1992, when these expenditures totaled \$5.1 billion. Establishments in NAICS 234 (Heavy construction) accounted for \$4.3 billion, or roughly 60 percent of the total. The C&D industries also spent \$7.7 billion on communication services, repairs to buildings and other structures, and repairs to machinery and equipment. NAICS 234 (Heavy construction) accounted for \$4.2 billion of this total.

**Table 2-27**  
**Selected Costs in the Construction Industry (Thousands of 1997 Dollars)**

NAICS	Industry	Materials, Components, and Supplies <sup>a</sup>	Construction Work Subcontracted out to Others <sup>b</sup>	Selected Costs of Power, Fuels, and Lubricants <sup>c</sup>					Total Selected Costs
				Electricity	Natural and Manufactured Gas	Gasoline and Diesel Fuel	Other, Including Lubricating Oils and Greases	Total Power, Fuels, and Lubricants	
233, except 2331	Building, developing, and general contracting, except land subdivision and development	\$79,936,341	\$179,427,020	\$599,022	\$134,485	\$1,179,930	\$73,637	\$1,984,736	\$261,348,110
2331	Land subdivision and development	\$1,778,171	\$3,387,700	\$31,244	\$9,068	\$46,600	S	\$89,251	\$5,255,122
234	Heavy construction	\$36,655,772	\$22,202,246	\$340,172	\$160,257	\$2,409,752	\$250,340	\$3,160,521	\$62,018,540
235 <sup>d</sup>	Special trade contractors	\$3,254,362	\$1,780,731	\$38,952	\$12,973	\$540,227	\$51,789	\$643,942	\$5,679,034
<b>TOTAL</b>		<b>\$121,624,646</b>	<b>\$206,797,697</b>	<b>\$1,009,390</b>	<b>\$316,783</b>	<b>\$4,176,509</b>	<b>\$375,766</b>	<b>\$5,878,450</b>	<b>\$334,300,806</b>

<sup>a</sup> Costs to reporting establishments during 1997 for the purchase of all materials, components, and supplies, except fuels. Does not include industrial and other specialized machinery and equipment such as printing presses and computer systems, and materials furnished to contractors by the owners of projects.

<sup>b</sup> Costs during 1997 for construction work subcontracted out to other contractors, not including costs of purchasing materials, components, and supplies provided to a subcontractor for use and costs for machinery and equipment rental.

<sup>c</sup> Costs include fuels, lubricants, and electric energy purchased during the year from other companies or received from other establishments of the company and costs for natural and manufactured gas, fuel oil, coal, and coke products.

<sup>d</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

S Withheld because estimate did not meet publication standards on the basis of either response rate, associated relative standard error, or a consistency review.

Source: U.S. Census Bureau (2000a).

**Table 2-28**  
**Additional Selected Costs in the Construction Industry (Thousands of 1997 Dollars)**

NAICS	Description	Machinery, Equipment, and Buildings			Selected Purchased Services			
		For Machinery and Equipment <sup>a</sup>	For Buildings <sup>b</sup>	Total	Communication Services <sup>c</sup>	Repairs to Buildings and Other Structures <sup>d</sup>	Repairs to Machinery and Equipment <sup>e</sup>	Total
233, except 2331	Building, developing, and general contracting, except land development and subdevelopment	\$1,403,930	\$901,176	\$2,260,517	\$1,260,796	\$203,102	\$1,060,589	\$2,521,488
2331	Land subdivision and development	S	\$36,251	\$80,840	\$54,022	\$10,048	\$39,290	\$103,359
234	Heavy construction	\$3,853,016	\$444,702	\$4,297,718	\$647,860	\$188,895	\$3,349,522	\$4,186,276
235 <sup>e</sup>	Special trade contractors	\$615,405	\$91,657	\$707,063	\$133,414	\$28,471	\$729,510	\$891,395
<b>TOTAL</b>		<b>\$5,872,351</b>	<b>\$1,473,786</b>	<b>\$7,346,138</b>	<b>\$2,096,092</b>	<b>\$430,516</b>	<b>\$5,178,911</b>	<b>\$7,705,518</b>

<sup>a</sup> Includes all costs during 1997 for renting or leasing construction machinery and equipment, transportation equipment, production equipment, office equipment, furniture and fixtures, scaffolding, etc.

<sup>b</sup> Includes all costs of renting or leasing office space and buildings.

<sup>c</sup> Includes all costs during 1997 for communication services purchased from other companies or from other establishments of the company.

<sup>d</sup> Includes the cost of all repairs made to structures and equipment by outside companies or from other establishments of the same company. Only costs required to maintain property and equipment are reflected here.

<sup>e</sup> Covers establishments in NAICS 23593 (Excavation contractors) and NAICS 23594 (Wrecking and demolition contractors) only.

S Withheld because estimate did not meet publication standards on the basis of either response rate, associated relative standard error, or a consistency review.

Source: U.S. Census Bureau (2000a).

### 2.5.3 Capital Expenditures and Depreciation

In addition to the materials costs discussed above, the Census of Construction reports on the capital expenditures incurred by construction establishments. Among these capital expenditures are the costs incurred to cover the acquisition, construction, and the major alteration of the establishment's own new and used buildings and other structures, and the acquisition of machinery and equipment. Table 2-29 presents data for total capital expenditures and depreciation for buildings, structures, machinery, and equipment, both new and used.<sup>34</sup>

Table 2-29 presents total capital expenditures for NAICS 233 (Building and developing), 234 (Heavy construction), 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors). Total capital expenditures (other than land) were \$9.5 billion in 1997, which represented a 51.6 percent increase over the \$4.9 billion spent in 1992. Beginning of year gross book value of depreciable assets totaled \$70.6 billion in 1997. Of this, NAICS 233 (Building and developing, including NAICS 2331) accounted for \$20.3 billion (28.8 percent). Establishments in NAICS 234 (Heavy construction) accounted for 60.0 percent of the total with \$42.4 billion and establishments in NAICS 235 (Special trade contractors) accounted for 11.2 percent of total value with \$7.9 billion. Depreciation charges during the year totaled \$7.8 billion, with NAICS 234 (Heavy construction) accounting for \$4.6 billion, or 59.3 percent of total depreciation charges. NAICS 233 (Building, developing, and general contracting, including NAICS 2331) accounted for \$2.2 billion (27.9 percent) and NAICS 235 (Special trades contractors) accounted for \$1.0 billion (12.8 percent) of total depreciation charges.

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<sup>34</sup> The 1992 Census of Construction presented considerably more detailed data on capital expenditures, first dividing capital costs into those for (a) buildings and structures, and (b) machinery and equipment and then further subdividing these costs by "new" and "used" categories. The 1997 Census of Construction reports only the industry's total capital expenditure figures.

**Table 2-29**  
**Capital Expenditures in the Construction Industry: Total (Thousands of 1997 Dollars)<sup>a</sup>**

NAICS	Description	Beginning-of-year gross book value of depreciable assets	Capital expenditures, other than land	Retirements and disposition of depreciable assets	End-of-year gross book value of depreciable assets	Depreciation charges during year
233, except 2331	Building, developing, and general contracting, except land development and subdevelopment	\$18,737,612	\$2,761,153	\$940,445	\$20,558,320	\$2,021,179
2331	Land subdivision and development	\$1,571,722	\$276,804	\$102,440	\$1,746,086	\$152,751
234	Heavy construction	\$42,372,868	\$5,313,180	\$1,839,777	\$45,846,272	\$4,627,363
235 <sup>b</sup>	Special trade contractors	\$7,890,728	\$1,104,527	\$291,243	\$8,704,113	\$1,001,533
<b>TOTAL</b>		<b>\$70,572,930</b>	<b>\$9,455,664</b>	<b>\$3,173,905</b>	<b>\$76,854,791</b>	<b>\$7,802,826</b>

<sup>a</sup> Capital expenditures refers to all costs actually incurred during 1997 which were or would be chargeable to the fixed assets accounts of the reporting establishments and which were the type for which depreciation accounts are ordinarily maintained. These expenditures cover the acquisition, the construction, and the major alteration of the reporting establishment's own buildings and other structures, and the acquisition of machinery and equipment.

<sup>b</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Source: U.S. Census Bureau (2000a).

#### 2.5.4 Value of Inventories

The Census of Construction Industries presents data on establishments' end-of-year inventories of materials and supplies. A total of 47,841 establishments in the C&D industries reported holding inventories of materials and supplies at the end of 1997. These inventories were valued at \$7.0 billion at the end of the year. An additional 109,094 establishments reported no inventories, while 104,680 establishments did not report their inventories. Table 2-30 presents the inventory data for C&D establishments.

**Table 2-30**  
**Total Value of Inventories for Construction Industry Establishments, 1997 (\$1,000)**

NAICS	Description	Establishments with Inventories <sup>a</sup>				Establishments without Inventories		Establishments not Reporting	
		Number	Value of Construction Work <sup>b</sup>	End of year Materials & Supply Inventory	Beginning of year Materials & Supply Inventory	Number	Value of Construction Work <sup>b</sup>	Number	Value of Construction Work <sup>b</sup>
233, except 2331	Building, developing, and general contracting, except land development and subdevelopment	33,100	\$89,182,562	\$5,648,406	\$5,015,102	81,735	\$196,519,085	76,268	\$82,304,448
2331	Land subdivision and development	2,248	\$2,137,038	\$269,847	\$214,701	1,486	\$2,993,955	4,452	\$8,504,528
234	Heavy construction	9,634	\$50,131,852	\$1,017,171	\$910,164	17,864	\$54,143,044	15,058	\$23,566,700
235 <sup>c</sup>	Special trade contractors	2,859	\$8,865,177	\$35,467	\$61,040	8,009	\$7,389,990	8,902	\$4,655,603
<b>TOTALS</b>		<b>47,841</b>	<b>\$150,316,629</b>	<b>\$6,970,891</b>	<b>\$6,201,007</b>	<b>109,094</b>	<b>\$261,046,074</b>	<b>104,680</b>	<b>\$119,031,279</b>

<sup>a</sup> Inventory includes all of the materials and supplies that are owned regardless of where they are held, excluding materials that are owned by others, but held by the reporting establishment.

<sup>b</sup> Value of construction work includes all value of construction work done during 1997 for construction work performed by general contractors and special trades contractors. Included is new construction, additions and alterations or reconstruction, and maintenance and repair construction work. Also included is the value of any construction work done by reporting establishments for themselves.

<sup>c</sup> Covers establishments in NAICS 23593 (Excavation contractors) and 23594 (Wrecking and demolition contractors) only.

Source: U.S. Census Bureau (2000a).

Among establishments in the C&D industries that reported inventories, NAICS 233 (Building, developing, and general contracting, including NAICS 2331) accounted for \$5.9 billion or 84.9 percent of the total. A further \$1.0 billion was reported by NAICS 234 (Heavy construction), representing 14.6 percent, while NAICS 235 (Special trades contractors) held \$35.5 million in materials and supplies (1.0 percent).

## 2.6 KEY BUSINESS INDICATORS AND RATIOS

Table 2-31 below presents key financial characteristics for the construction industry as a whole (i.e., not just C&D industries). The items presented in the table are taken from Dun and Bradstreet's (D&B) *Industry Norms & Key Business Ratios Desk-Top Edition 1999-2000*. D&B bases this report on more than one million financial statements of U.S. corporations, partnerships and proprietorships, in all size ranges, including more than 800 business sectors defined by SIC codes. Though the Census Bureau is now using NAICS codes for most reporting of industry data, Dun & Bradstreet continues to use SIC codes. Therefore, Table 2-31 differs from the rest of this profile in presenting data based on the SIC code system.

In addition to various financial terms, Table 2-31 also presents a series of financial ratios for solvency, efficiency, and profitability. The table also notes the sample size of the financial statements used to estimate the values in each SIC code. The sample size for SIC 15 (General building contractors) is roughly three times the sample size for this SIC in 1998 (6,746 establishments versus 2,138). The sample size for SIC 16 (Heavy construction) also increased from 1998, from 2,135 to 2,847. The sample sizes for SICs 1794 (Excavation work) and 1795 (Wrecking and demolition work) are, as expected, much smaller than the sample sizes for the previous two SICs, at 755 and 87 establishments, respectively.

Solvency, or liquidity, ratios are used to evaluate a company's ability to meet short and long-term obligations and include the Quick Ratio, Current Ratio, Current Liability to Net Worth, Current Liability to Inventory, Total Liability to Net Worth, and Fixed Assets to Net Worth. The Quick Ratio is defined as the sum of cash and accounts receivable divided by total current liabilities and reveals the amount of liquid assets available to cover each dollar of current debt. The larger this ratio, the greater the liquidity.

The Current Ratio is calculated by dividing current assets by current liabilities; this ratio measures the margin of safety available to cover any possible shrinkage in the value of current assets. The quotient of current liabilities divided by net worth is the Current Liability to Net Worth ratio and relates the funds that are temporarily risked by creditors with the funds permanently invested by owners. Another ratio, Current Liability to Inventory, is obtained by dividing current liabilities by inventory, and is an indicator of the extent to which a business relies on funds from disposal of unsold inventories to meet its debts. Total Liability to Net Worth, calculated by dividing total liabilities by net worth, can be used to determine the effect of long-term (funded) debt on a business when compared with the Current Liabilities to Net Worth ratio. The final solvency ratio, Fixed Assets to Net Worth, is calculated when fixed assets are divided by Net Worth and identifies the proportion of net worth that consists of fixed assets. Chapter Four presents the financial characteristics of model firms in the C&D industry and an analysis of the effects of the proposed rule on the financial health of the model firms.



**Table 2-31**  
**Key Business Statistics and Ratios of the Construction Industry (1999)<sup>a</sup>**

SIC	15	1521	1522	1531	1541	1542	16	1611	1622	1623	1629	1794	1795
Item	Building Constn. General Contrs. and Operative Builders	General Contrs. -- Single- Family Houses	General Contrs. -- Residential Buildings, Other Than Single- Family	Operative Builders	General Contrs. -- Industrial Buildings and Warehouses	General Contrs. - Non- residential Buildings, Other Than Industrial Buildings and Warehouses	Heavy Constn. Other Than Building Constn. Contrs.	Highway and Street Constn., Except Elevated Highways	Bridge, Tunnel, and Elevated Highway Constn.	Water, Sewer, Pipeline, and Communi- cations and Power Line Constn.	Heavy Constn., NEC	Excavation Work	Wrecking and Demolition Work
Sample Size <sup>b</sup>	6,746	1,780	283	112	870	3,701	2,847	959	159	1,086	643	755	87
Cash	245,212	102,836	250,363	425,696	309,137	323,254	277,028	333,899	385,604	238,632	247,547	132,318	137,765
Accounts Receivable	374,595	112,769	364,659	318,378	579,430	532,241	459,331	536,775	461,613	444,349	384,015	247,424	371,096
Notes Receivable	11,090	7,012	17,689	25,041	14,567	10,525	10,724	12,680	3,708	9,874	11,108	6,455	6,206
Inventory	71,469	84,138	57,148	1,087,493	24,278	30,070	37,533	46,492	31,516	27,978	44,431	17,212	31,028
Other Current Assets	247,675	108,094	303,429	790,579	313,992	315,737	257,368	278,954	317,010	245,215	228,504	96,818	162,587
Total Current Assets	950,041	414,849	993,288	2,647,187	1,241,404	1,211,827	1,041,984	1,208,800	1,199,451	966,048	915,605	500,227	708,682
Fixed Assets	209,477	129,129	261,248	565,210	280,004	215,002	639,846	794,596	532,060	580,945	566,501	531,423	480,315
Other Non- current	72,701	40,317	106,132	364,883	97,111	76,678	105,450	109,891	122,355	98,744	104,731	44,106	52,128
Total Assets	1,232,219	584,295	1,360,668	3,577,280	1,618,519	1,503,507	1,787,280	2,113,287	1,853,866	1,645,737	1,586,837	1,075,756	1,241,125
Accounts Payable	312,984	92,903	327,921	293,337	424,052	457,066	266,305	336,013	292,911	230,403	231,678	112,954	142,729
Bank Loans	8,626	7,596	10,885	60,814	3,237	7,518	8,936	10,566	3,708	6,538	9,521	7,530	7,447
Notes Payable	54,218	49,665	83,001	525,860	38,844	36,084	64,342	73,965	40,785	57,601	66,647	59,167	71,985
Other Current Liabilities	272,319	170,614	459,906	1,019,525	310,756	275,142	298,476	321,220	339,257	291,295	271,350	204,394	245,743
Total Current Liabilities	648,147	320,778	881,713	1,899,536	776,889	775,810	638,059	741,764	676,661	585,882	579,196	384,045	467,904
Other Long Term Debt	99,810	79,464	134,706	422,119	119,770	81,189	266,305	336,013	226,172	236,987	242,785	244,197	249,466

**Table 2-31**  
**Key Business Statistics and Ratios of the Construction Industry (1999)<sup>a</sup>**

SIC	15	1521	1522	1531	1541	1542	16	1611	1622	1623	1629	1794	1795
Item	Building Constn. General Contrs. and Operative Builders	General Contrs. -- Single- Family Houses	General Contrs. -- Residential Buildings, Other Than Single- Family	Operative Builders	General Contrs. -- Industrial Buildings and Warehouses	General Contrs. - Non- residential Buildings, Other Than Industrial Buildings and Warehouses	Heavy Constn. Other Than Building Constn. Contrs.	Highway and Street Constn., Except Elevated Highways	Bridge, Tunnel, and Elevated Highway Constn.	Water, Sewer, Pipeline, and Communi- cations and Power Line Constn.	Heavy Constn., NEC	Excavation Work	Wrecking and Demolition Work
Deferred Credits	2,464	1,169	5,443	28,618	1,619	3,007	7,149	10,566	11,123	4,937	3,174	3,227	4,965
Net Worth	481,798	182,884	338,806	1,227,007	720,241	643,501	875,767	1,024,944	939,910	817,931	761,682	444,287	518,790
Total Liability & Net Worth	1,232,219	584,295	1,360,668	3,577,280	1,618,519	1,503,507	1,787,280	2,113,287	1,853,866	1,645,737	1,586,837	1,075,756	1,241,125
Net Sales	4,191,221	1,941,179	4,490,653	5,176,961	5,359,334	5,238,700	3,910,897	4,727,711	4,128,878	3,562,201	3,397,938	2,130,210	2,709,880
Gross Profit	779,567	475,589	853,224	1,180,347	986,117	832,953	985,546	1,054,280	792,745	961,794	965,014	705,100	875,291
Net Profit After Tax	138,310	77,647	157,173	62,124	182,217	157,161	175,990	203,292	156,897	167,423	152,907	104,380	124,654
Working Capital	301,894	94,071	111,575	747,651	464,515	436,017	403,925	467,036	522,790	380,166	336,409	116,182	240,778
RATIOS (median)													
SOLVENCY RATIOS													
Quick Ratio (times)	1.1	0.8	1.0	0.2	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.1	1.2
Current Ratio (times)	1.5	1.4	1.5	1.4	1.6	1.5	1.6	1.6	1.8	1.7	1.6	1.4	1.6
Current Liability to Net Worth (%)	122.3	115.5	102.7	143.2	107.7	128.1	65.7	67.1	62.9	64.2	66.6	65.5	75.1
Current Liability to Inventory (%)	740.3	153.5	837.6	96.9	999.9	999.9	999.9	999.9	999.9	999.9	841.5	999.9	668.1
Total Liability to Net Worth (%)	145.9	157.4	128.0	179.6	130.0	145.6	100.1	103.1	93.5	96.3	100.6	119.3	116.9

**Table 2-31**  
**Key Business Statistics and Ratios of the Construction Industry (1999)<sup>a</sup>**

SIC	15	1521	1522	1531	1541	1542	16	1611	1622	1623	1629	1794	1795
Item	Building Constn. General Contrs. and Operative Builders	General Contrs. -- Single- Family Houses	General Contrs. -- Residential Buildings, Other Than Single- Family	Operative Builders	General Contrs. -- Industrial Buildings and Warehouses	General Contrs. - Non- residential Buildings, Other Than Industrial Buildings and Warehouses	Heavy Constn. Other Than Building Constn. Contrs.	Highway and Street Constn., Except Elevated Highways	Bridge, Tunnel, and Elevated Highway Constn.	Water, Sewer, Pipeline, and Communi- cations and Power Line Constn.	Heavy Constn., NEC	Excavation Work	Wrecking and Demolition Work
Fixed Assets to Net Worth (%)	25.9	37.0	23.1	17.1	27.6	23.0	68.5	75.4	51.7	66.1	68.6	105.0	77.8
<b>EFFICIENCY RATIOS</b>													
Collection Period (days)	42.0	21.5	39.1	4.8	47.1	48.2	49.6	46.4	46.7	54.6	49.3	51.5	56.2
Sales to Inventory (times)	65.3	13.8	34.8	2.6	203.7	149.9	86.2	98.2	78.8	96.8	53.5	99.4	46.5
Assets to Sales (%)	29.4	30.1	30.3	69.1	30.2	28.7	45.7	44.7	44.9	46.2	46.7	50.5	45.8
Sales to Net Working Capital (times)	12.5	12.1	10.5	6.6	11.8	12.9	9.0	9.5	7.7	8.5	8.9	9.7	8.3
Accounts Payable to Sales (%)	7.2	4.3	6.5	3.9	7.6	8.6	5.7	5.9	5.6	5.8	5.4	5.0	4.6
<b>PROFITABILITY RATIOS</b>													
Return on Sales (%)	2.0	2.5	2.6	2.9	2.0	1.8	3.2	3.0	3.1	3.5	3.2	3.5	3.4
Return on Assets (%)	6.5	8.0	6.7	4.4	6.5	6.0	6.6	6.5	6.4	6.9	6.6	6.7	9.0
Return on Net Worth (%)	18.3	27.5	22.7	16.8	15.1	16.4	15.5	14.8	12.9	16.4	15.0	17.7	24.2

<sup>a</sup>The dollar figures are the result of translating the common-size percentages into dollar figures. Common-size percentages are calculated for each item as a percentage of its respective aggregate total. The dollar figures are then computed by multiplying the common-size percentages for each statement item by their respective total amounts. This detailed data is not available for NAICS 655

<sup>b</sup>Number of establishments upon which calculations are based.

Source: Dun and Bradstreet Industry Norms & Key Business Ratios 1999-2000.

Efficiency ratios are indicators of how effectively a company uses and controls its assets. The five efficiency ratios presented by D&B are Collection Period, Sales to Inventory, Asset to Sales, Sales to Net Working Capital, and Accounts Payable to Sales. The Collection Period, measured in number of days, is calculated by multiplying 365 by the quotient of accounts receivable divided by sales. This measure helps determine the quality of the receivables of a company when compared with selling terms and industry norms. Dividing annual net sales by inventory results in the Sales to Inventory ratio, an indicator of the rapidity with which merchandise moves and the effect of the flow of funds into the business. Total assets are divided by net sales to obtain the Asset to Sales ratio. This ratio relates sales volume to the total investment used to generate those sales. Another sales-related ratio, Sales to Net Working Capital, is obtained by dividing sales by net working capital. This is an indicator of whether a company is overtrading or, conversely, carrying more liquid assets than needed for its volume. Finally, dividing accounts payable by annual net sales yields the Accounts Payable to Sales ratio, which measures how the company is paying its suppliers in relation to the volume being transacted.

D&B also reports three measures of profitability: Return on Sales (also known as Profit Margin), Return on Assets, and Return on Net Worth (also known as Return on Equity). These profitability ratios show how successfully a business is at earning a return for its owners. The Return on Sales ratio is computed by dividing net profits after taxes by annual net sales; this measure reveals the profits earned per dollar of sales, and ultimately is an indicator of the operation's efficiency. The Return on Assets ratio, derived by dividing net profit after taxes by total assets, is a key indicator of a firm's profitability as it matches operating profits with the assets available to earn a return. The final financial ratio is Return on Net Worth, or the value of net profit after taxes divided by net worth. This ratio can be used to analyze the ability of the firm to achieve an adequate return on the capital invested by the owners.

Further information about all ratios presented in D&B can be found in Appendix 2C.

## **2.7 INDUSTRY GROWTH**

Table 2-32 presents annual totals for private housing units authorized by building permits for 1981 through 1999, by type of structure. These data show fluctuation in the number of units authorized each year, increasing from 985,500 units in 1981 to a peak of 1.8 million units in 1986. The period of 1987 through 1991 was marked by a steady decrease, with a low of 948,800 units in 1991. The number of units authorized then began a steady increase to 1.7 million units in 1999, representing an annual growth rate of 9.4 percent from 1991 to 1999. Table 2-33 shows national growth in terms of value of housing units authorized by building permits, by type of structure. Valuation of units authorized has grown from \$78.8 billion in 1991 to \$181.2 billion in 1999 (nominal), with an annual growth rate of 16.3 percent.

Total value of new privately owned housing units rose steadily from 1991 to 1994. From 1994 to 1995, total value of new privately owned housing units declined slightly, from \$123.3 billion to \$120.8 billion. This decrease was realized only in the 1-unit sector, which showed a decline from \$109.3 billion in 1994 down to \$104.8 billion in 1995; the remaining sectors actually realized continued increases in value.

**Table 2-32**  
**New Privately Owned Housing Units Authorized by Building Permit - Annual (Number of Housing Units), 1981-1999**

Year	Total Units	Number of Units by Type of Structure			
		1 Unit	2 units	3 and 4 units	5 units or more
1981	985,500	564,300	44,600	57,200	319,400
1982	1,000,500	546,400	38,400	49,900	365,800
1983	1,605,200	901,500	57,500	76,100	570,100
1984	1,681,800	922,400	61,900	80,700	616,800
1985	1,733,300	956,600	54,000	66,100	656,600
1986	1,769,400	1,077,600	50,400	58,000	583,500
1987	1,534,800	1,024,400	40,800	48,500	421,100
1988	1,455,600	993,800	35,000	40,700	386,100
1989	1,338,400	931,700	31,700	35,300	339,800
1990	1,110,800	793,900	26,700	27,600	262,600
1991	948,800	753,500	22,000	21,100	152,100
1992	1,094,900	910,700	23,300	22,500	138,400
1993	1,199,100	986,500	26,700	25,600	160,200
1994	1,371,600	1,068,500	31,400	30,800	241,000
1995	1,332,500	997,300	32,200	31,500	271,500
1996	1,425,600	1,069,500	33,600	32,200	290,300
1997	1,441,100	1,062,400	34,900	33,600	310,300
1998	1,612,300	1,187,600	33,200	36,000	355,500
1999	1,663,500	1,246,700	32,500	33,300	351,100

Source: Bureau of the Census (2000e).

**Table 2-33**  
**Value of New Privately Owned Housing Units Authorized by Building Permit, Annual (Millions of Dollars)**

Year	Total Value	Valuation by Type of Structure			
		1 unit	2 units	3 and 4 units	5 units or more
1991	\$78,772.2	\$69,772.7	\$1,169.6	\$1,061.6	\$6,818.3
1992	\$95,539.0	\$87,071.5	\$1,272.2	\$1,126.2	\$6,069.2
1993	\$106,801.0	\$97,118.6	\$1,478.6	\$1,281.7	\$6,922.0
1994	\$123,278.3	\$109,294.0	\$1,813.3	\$1,595.7	\$10,575.3
1995	\$120,810.7	\$104,738.7	\$1,910.4	\$1,713.3	\$12,448.4
1996	\$134,175.8	\$116,535.0	\$2,069.1	\$1,861.4	\$13,710.2
1997	\$141,004.4	\$121,194.5	\$2,304.0	\$2,057.7	\$15,448.2
1998	\$165,265.7	\$142,240.8	\$2,254.2	\$2,282.0	\$18,488.8
1999	\$181,245.7	\$157,123.5	\$2,319.9	\$2,317.5	\$19,485.2

Source: Bureau of the Census (2000e).

## 2.8 INTERNATIONAL COMPETITIVENESS

Construction activities are highly localized, with most activities being performed either within the state the establishment is located in or within neighboring states. Some of the largest builders may perform work nationwide. The Census Bureau reports only construction activities within the United States; no data is reported on construction work by U.S. establishments that takes place outside the U.S. (Census, 2000a). EPA concludes that only a very small percentage of construction work done by U.S. construction firms is conducted outside of the U.S.

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